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ABSTRACT

This study addresses itself to several questions important to most public libraries. How should the library allocate its book budget? What kinds of books should it tend to buy? What types of households use the library? Why do some households not use the library? What is the cost of the various services provided by the library? What specific steps can the library take to improve its services? What are the library's options in choosing among the different circulation systems? For how long should the library allow books to be checked out? How frequently should overdue notices be sent out? Is an investment in a security system worthwhile? These questions were studied in the context of the Beverly Hills (California) Public Library. A methodology for determining answers to these questions, as well as to other questions that arose during the investigation was developed. Although answers will vary from library to library, the methodology is quite general and should prove useful at many public libraries. The user survey and community survey questionnaires, and a bibliography are appended. (Author/SJ)

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February 1972
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AN ECONOMIC ANALYSIS OF PUBLIC LIBRARY SERVICES

Joseph P. Newhouse
Arthur J. Alexander

Prepared for the City of Beverly Hills

Rand
SANTA MONICA, CA. 90406

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PREFACE

THIS STUDY of public libraries was made possible by a gift from an anonymous resident of Beverly Hills to the city. Our first acknowledgment must naturally be to him. We are also most indebted to Miss June Bayless, City Librarian of Beverly Hills. She was an active participant in the study, helping us to design the questionnaires, answering questions about library operations, and cheerfully coping with the inevitable dislocations that occur when data are gathered, as well as with the impertinence of two nonlibrarians.

Numerous other individuals assisted us during the study. Particular mention should be made of Miss Carolyn Reese, who compiled the data from which the program budget was constructed, and of a number of Friends of the Beverly Hills Library who helped with the survey of users: Mrs. Samuel Goldman, Mrs. Marvin Freilich, Mrs. Richard Livingston, Mrs. Irwin Pincus, Mrs. Joseph Westheimer, Miss Judith Albert, and Mrs. Berny Byrens. The staff of the library was always most helpful to us. Systems cost figures in Chapter VI were developed with the assistance of Stephen W. Jones, Service Bureau Corporation. Robert Shishko and Helen Waldron gave us useful comments on a preliminary draft. Lindy Clark provided very helpful research assistance. Dorothy Stewart edited and greatly improved the readability of the manuscript.

Joseph Newhouse is primarily responsible for Chapters I through V and Chapter VII; Arthur Alexander is primarily responsible for Chapter VI. Some initial work on this study was done by Richard Moorsteen and Charles A. Cooper, who unfortunately were not able to see the study through to its conclusion.

SUMMARY

THIS STUDY addresses itself to several questions important to most public libraries. How should the library allocate its book budget? What kinds of books should it tend to buy? What types of households use the library? Why do some households not use the library? What is the cost of the various services provided by the library? What specific steps can the library take to improve its services? What are the library's options in choosing among the different circulation systems? For how long should the library allow books to be checked out? How frequently should overdue notices be sent out? Is an investment in a security system worthwhile?

We have studied these questions in the context of one public library—the Beverly Hills (California) Public Library—and have developed a methodology for determining answers to them, as well as to other questions that arose during our investigation. Although answers will vary from library to library, our methodology is quite general and should prove useful at many public libraries.

In our study of the Beverly Hills Library, we found that the benefit/cost ratio differs greatly among various classes of books. Those having the highest benefit/cost ratios in this library are Mysteries, Preschool and Young Adult Fiction, Psychology, and Art Techniques. The ratio in these classes exceeds the ratio in the lowest classes by a factor of roughly twenty. Hence, reallocating the book budget among classes could substantially increase the benefit that the community derives from the library. Since we do not know how much the benefits decrease with acquisitions in these classes, we cannot say to what extent they should be strengthened or by how much the total benefit can be increased. However, unless it appears that readers of books in these classes are already receiving an unfair share of library benefits, the library's acquisition policy should be oriented toward these and other high-usage classes. Although less weight should be given to our estimates of the absolute size of the benefit/cost ratio, for many classes it exceeds one. Moreover, in calculating this figure, we have ignored in-library use (it would not change relative class rank-

ings very much and they were our chief concern) and have assumed a rather low ratio of benefits received by borrowers relative to benefits received by book owners. Thus, the actual figure for most classes probably exceeds one, sometimes greatly.

The Beverly Hills Library appears to be quite heavily used compared with other libraries. We found that households with children make the greatest use of the library. About half of the users are students, most of whom are working on school assignments. College and university students constitute about 40 percent of the student users. Most of the students using the library do so simply because they prefer the public library to the school library, not because the school library lacks the relevant materials. However, despite the large student use, the most common reason for using the library is to obtain material for leisure reading. In Beverly Hills, there appears to be no association between income or education and use of the library, once the presence or absence of a child in the household is taken into account. It appears that there is little that can be done to cause nonusers to use the library. Further, since the presence or absence of a child is critical in determining a household's use, declining family size may mean that the demand for library services will increase at a much slower rate in the future. However, there is substantial use of the Beverly Hills Library by nonresidents, most of whom are not employed in Beverly Hills. Of the college and university students who use the library, nearly one-half are nonresidents.

The labor costs of acquiring, cataloging, and processing new volumes at Beverly Hills are $5.55 per volume. This means that the purchase price of a book is only slightly more than one-half of the true acquisition cost. Figures from other libraries are similar, but it is difficult to make comparisons because of possible differences in wage rates and scale of operations. The cost of the reference service and the readers advisory service is approximately $0.80 per in-library visit. These figures are not difficult to gather and should be collected on a regular basis.

The cost of automated circulation systems has been explored. While the present microfilm system is very inexpensive, it only tells the library that a book is overdue at the time that it is actually overdue, and who has it checked out. A computerized system will provide more information, but at a price. Such additional information will enable the librarian to determine (1) which books are circulating and how frequently, thus facilitating the ordering of duplicate copies and indicating which types of books are in demand; (2) the due date of any book and who has checked it out; (3) which books are lost, since it is possible to know immediately if a missing book has been checked out. One computerized system also has the potential capability of printing overdue notices by machine and of compiling mailing lists and machine addressing mailings to library patrons.

In estimating the effect of changing the time books are allowed to circulate, we assumed that increasing the checkout period increased, proportionately, the length of time that patrons keep books. With the current 2-week checkout period, we estimate that two-thirds of requests for titles are satisfied; if the checkout period were 3 weeks, the number of requests satisfied would drop to about 60 percent, and with a 4-week checkout period, to around 55 percent. In other words, circulation would decrease about 10 percent with a 3-week checkout period and about 20 percent

with a 4-week checkout period, assuming that users took advantage of the additional time. Since by far the most frequent date of return is the exact due date, this assumption seems warranted.

An investigation of the magnitude of the missing book problem revealed that lost books cost the library around $6000 to $8000 per year, and possibly as much as $12,000. We have priced one mechanical security system. If it is nearly 100 percent effective, it appears to be worth the price.

There were a number of indications that residents would welcome more information about library activities. One possibility is to establish a mailing list to publicize new acquisitions and special events, perhaps in conjunction with a book-by-mail program. When queried about a book-by-mail program, a sizable number of residents indicated interest, even with a $3.00 yearly charge. Other suggestions for improving library services were to put a directory to the collection near the library entrance to assist users in locating materials; to experiment with Sunday hours (but record the number of users); to consider renting best sellers; and to establish a book drop in the parking lot to facilitate the return of books.

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I

ECONOMICS AND PUBLIC LIBRARIES

WHILE THIS REPORT is concerned with a number of problems faced by all public libraries, large or small, the principal question it seeks to answer is: How should a public library determine which books to buy? In other words, how should it allocate its book budget? The answer to this question could have been derived in the abstract, but we felt that it would be of limited utility unless it were structured around the needs of a particular library. The Beverly Hills Public Library agreed to cooperate with us in developing a tool that would enable us to provide a practical answer.

The Beverly Hills Library serves a community of 33,416 (1970 census) persons, whose per capita income is the highest of any city in California. It is a single library with no branches; it has approximately 120,000 volumes and an annual circulation of around 322,000. There were about 16,000 cardholders in 1969. The library's budget approved by the City Council for fiscal year 1971 was $337,000. Approximately 70 percent of this amount was allocated to salaries.

Those in charge of the Beverly Hills Library were seeking answers to a number of other questions pertinent to its operation. For example: What kinds of households make use of the library? What does a program budget for the library reveal about how the library is allocating its budget? What are sensible alternatives for a medium-sized library with regard to circulation systems? What problems do members of the community perceive about the operation of this library? How can the library improve its service to the community? We have tried to address these questions, and many of the answers should prove interesting to libraries other than Beverly Hills.

At the outset one might ask: Why should economists study library operations? After all, they know less about them than librarians. The answer is that libraries are one of many kinds of institutions that produce goods and services of value to the public. Economics provides a general framework for analyzing the benefits these institutions afford consumers, and the costs. We have taken some of the tools provided by economic theory for measuring benefits and costs and applied them to

public libraries. Because economic theory attempts to be rigorous, we have had to use terminology and mathematical expressions in parts of Chapters II and III that will be unfamiliar to the noneconomist. These portions of the study may be skipped or skimmed lightly by readers who do not have a technical background in economics.[1] Generally, however, we have tried to provide the reader with a nontechnical explanation of the material.

The plan of the study is as follows: Chapter II describes the book-selection model that was developed to increase the amount of benefit that the library can provide the community for a given book budget, and Chapter III shows how the model was applied at the Beverly Hills Library. Two of the results obtained from the model are the types of books that the library should acquire, and an estimate of the benefits derived from each type of book relative to its cost. Chapter III draws principally on the results obtained from following the circulation of a sample of slightly more than 1 percent of the books in the Beverly Hills collection for about 1 year. It also uses the results of a survey of library users conducted in March 1971. This user survey sought information about materials that patrons used in the library but did not check out, in other words about library use that would not be recorded as circulation.

Who uses the library and why is discussed in Chapter IV. To determine characteristics of library users, this chapter employs data provided by the user survey. It also uses data obtained in a mail survey of 10 percent of the registered voters of Beverly Hills. This community survey, conducted late in 1970, solicited information on why households did or did not use the library, as well as information about the users' knowledge of library services and their opinions regarding improved services.

In Chapter V, a program budget is developed for the Beverly Hills Library, showing the costs of various functions. The costs of the present circulation system, obtained in Chapter V, are used in Chapter VI as a basis for comparing the costs of alternative circulation systems.

Chapter VII discusses a number of miscellaneous library problems and suggests ways in which the Beverly Hills Library can improve its service to the community.

[1] There is some suspicion among librarians of quantitative methods. For example, in discussing one (admittedly crude) attempt at quantitative evaluation, a librarian said: "[His] formula is being used here as an example of how completely quantitative formulas are greatly inadequate for evaluating the complexity of a library situation. They tend to be poorly founded in principle, do not take all variables into account, and are unsophisticated in design and mathematical operations. The result is not a meaningful assessment of library service" (Salverson 1969).

II

THE BOOK-SELECTION PROBLEM: A THEORETICAL MODEL

WHAT KINDS OF BOOKS should the library buy in order to derive maximum benefit from its funds? Allocation of its book budget is a problem faced by every library—public, college, or rental. As long as there is a gain to having a book physically in the library, there is a budget allocation problem. And if there is no gain, there is no reason to have a book budget. Libraries do, of course, have to make other allocation decisions. For example, they must decide how much to spend on reference services, what kind of circulation system to have, and so forth. Here we are focusing on the choice between one type of book versus another, not on the benefits provided by all library expenditure.

Because the book-selection problem is so universal, we decided to develop a model that would be applicable to both a single library, such as Beverly Hills, or to a library in a library system. Before discussing the model, however, it might be useful to review what librarians have said about book selection.[1]

QUALITY BOOKS AND USER DEMANDS

There appears to be considerable difference of opinion within the library profession about how to select books. Some librarians argue for what has been called the

[1] There is also some operations research literature on the subject which we do not review. Its general approach is to postulate a reasonable, though arbitrary, criterion for the library to maximize (Hamburg, *et al.*, 1970; Bourne 1965; Morse 1968). For a review of much of this literature, see Wessel and Cohrssen 1967. After sampling from this literature, our conclusion is the same as that of Wessel and Cohrssen: "The history of efforts to evaluate critically the efficiency of library operations and the effectiveness of library services leaves the investigator still groping for satisfactory methods." This is not to say, of course, that these studies are of no value. Indeed, we shall use a technique developed in one such study in Chapter III.

"supplier-oriented" view, which maintains that the librarian has been trained to select "quality" books for the public to read and the public employs the librarian to do so. A variant of this argument is that the librarian should select books that will elevate the cultural level of the community. An alternative point of view is one that has been called "user-oriented": The library should supply books according to the demands of its users.

Some of the arguments for and against both points of view are given in the following excerpts. Leigh, in his summary volume of the Public Library Inquiry, criticizes user-oriented librarians:

> Our letter to the librarians contained the direct query: 'Do the current official objectives [of the American Library Association] definitely reject the idea that the library should, within budgetary limits, supply whatever the public demands or asks for?' Twenty-four thought that they clearly implied such rejection; twenty-seven agreed that they did but that in practice compromises are necessary. But twelve, the largest number of dissenters on any point, felt that the objectives are wrong. . . . There was in our sample a small, but energetic minority who see the public library's task solely as 'giving people what they want,' who would supply books, good or bad, on the basis of expressed public demand, irrespective of quality, reliability, or value. To them public libraries are a free, miscellaneous book service supported by the public for that purpose rather than a governmental service of reliable information and continuous education as implied in the objectives approved by the majority of librarians. This alternative not only turns away abruptly from the librarian's traditional faith in the ameliorative power of books, but also engages the public library in direct competition with the commercial agencies on their own terms. (Leigh 1950, pp. 22, 23, 224.)

The same opinions have been expressed by some librarians. One, a librarian at a medium-sized library, wrote:

> Most [librarians] would hesitate to purchase certain kinds of books because of the small number of readers they would attract. And yet the librarian must make certain key decisions in which book quality is not ignored because of a limited audience. When I was librarian of Salinas, Kansas, . . . we decided to purchase fewer 'recreational' books—books for casual enjoyment —in favor of more liberal purchases of more substantial, though less popular volumes. Of course, we might have purchased more generously in business, perhaps subscribing to the costly stock market services, but the librarian was convinced that a prime, though not exclusive obligation of *his* institution was to provide reading matter of superior quality. . . . The library is a true reflection of the librarian—*his taste,* interests, and his zeal for promoting reading of a superior type. (Cushman 1963, pp. 71, 75; emphasis added.)

Another is convinced that

> The librarian, like anyone else, but with greater effect, can register in himself and in his collection conformity and standardization of the mind; passivity before the living issues of his day and non-engagement 'where the immortal garland is to be run for'; subservience to the machine values of efficiency and uniform response. Or he can steer by the polar star of human communion and the centrality for libraries of imaginative writing. He can declare a principal concern for that which engages the spirit, not the epidermis. . . . Though no medium-sized public library can have everything, there should be ample provision of books on certain subjects, beyond responsive and responsible general coverage. . . . Library book selection that does not take account of community enthusiasms, and that does not take a lead sometimes in some places to develop latent reading interest, has not begun to enter the new interpretive from the old custodial day. (Smith 1963, pp. 79, 85, 87.)

There are a number of comments that could be made about these arguments. Many of them have been made by proponents of the user-oriented concept. Leon Carnovsky, of the School of Library Science at the University of Chicago, replied directly to Cushman and Smith:

> Choice must inevitably be made and [Smith] unequivocally casts his vote for the significant. The problem of significance is an extremely difficult one. Even without going into the question of what the word means (significant for whom? For what purpose? At what time?) we cannot expect the librarian —or anyone else for that matter—to make sound judgments in the limitless areas in which books are written. This is difficult enough even in adult fiction, and the professional critics are not invariably helpful. A recent article in the *New Yorker* reports that when Scott Fitzgerald's *Tender is the Night* was published, it was condemned as a failure; today it is selling at the rate of a half million a year. Can anyone question the obligation of the public library to make this 'failure' available? This is not to question the Cushman and Smith emphasis on the necessity of library standards in book selection and reader guidance, but only to suggest that it must be supplemented by an awareness of public demand, and of the utility of even less distinguished books in library collections. (Carnovsky 1963, p. 131.)

In short, it is not clear just how to elevate the public's taste. Further, libraries that ignore user demands may not be used:

> The library usually upholds the supplier-oriented concept in its professional literature, and adopts the user-oriented conception in actual practice, if only to get its budget approved. . . . A library that is not used sufficiently is a waste of resources, even if its goals are noble and the size and quality of its collec-

tion are outstanding: consequently, the library must be user-oriented. (Gans 1965, pp. 67, 69.)

The user-oriented and supplier-oriented concepts have differing implications for book selection. Should the librarian select books to elevate the readers' tastes, as Cushman and Smith would have her do, or should she select books the public wishes to read? To appraise the merits of the two concepts, it is necessary to inquire into the reason for having a public library rather than systems of private libraries. We have identified three reasons, all of which have implications for book selections.[2] Our own book-selection model derives from one of them.

First, the public library might be viewed as a kind of cooperative that reduces the cost to the community of obtaining material it wishes to read. While such a cooperative could be operated privately (and is, since rental libraries exist), there is a reason for having service free of charge: If one person wants to read a book that no other person wishes to read at that particular time, the person who wants the book can be made better off without making anyone else worse off if he is lent the book. However, if he must pay for the use of the book, and does not borrow it as a result, he is made worse off without anyone else being made any better off. The book is analogous to a bridge that is uncrowded even though no toll is charged: If a toll deters some individuals from crossing the bridge, they are made worse off, and no one else is made better off; hence, a toll should not be charged (Musgrave 1959, Ch. 7). In technical terms, since the marginal social cost is zero, the price of the service should also be zero.[3] If the service is free, it cannot be supplied privately; hence, there should be a public library.

The implication of this user-oriented rationale for book selection is that the library should find the "best" way of satisfying the demands of the community for library services; it should supply those books that the community expresses a desire to borrow from the library.

A second reason for the library's existence comes from the "supplier-oriented" concept: The community is ignorant of what constitutes good reading matter, and

[2] A fourth reason for the existence of a free public library is to redistribute income to library users. This reason has the same implications for book selection as the user-oriented concept.

[3] This statement ignores the possibility of imperfections in other markets, or what economists refer to as second-best problems. Since publishers have a legal monopoly on books, our case would probably be strengthened by taking account of imperfections in other markets. The statement that marginal social cost should be zero also ignores the consequences for income distribution. However, ignoring distributional problems seems reasonable in the context of a community such as Beverly Hills; further, according to evidence presented in Chapter IV, it appears as if there is little income redistribution among the various economic classes using the library services. Tiebout and Willis (1965) considered the rationale based on the uncrowded bridge analogy and rejected it, because they felt that abandoning the price system would mean that there was no long-run test of whether the service was profitable. (Tiebout and Willis, however, were concerned with a different problem; namely, should the public library impose user charges? We are considering book selection, but both problems lead to a consideration of the rationale for the public library in the first place.) In a sense, however, there is a long-run test, and that is determination of the size of the library's book budget, which takes place in the political process. Although this process is an imperfect transmitter of such information, it is not unreasonable to suppose that in most public libraries the marginal book is not too far away from being profitable for a rental library to own if there were not a public library. In fact, the numbers we present in Chapter III show that this is approximately correct in Beverly Hills.

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it wants the librarian to select reading matter that will elevate its tastes. Although individuals can (and do) purchase information from book clubs and book reviews about what constitutes good reading matter, this does not vitiate the need for a public library. Again, because charging a fee might discourage use with no corresponding savings in resources, the library should supply such books free and thus must be public. But, based on this rationale, the public library should purchase those books that elevate the cultural level of the community rather than books that the users demand, as the "user-oriented" concept implies.

A third reason for having a public library has to do with children and students who are among the heaviest users of library services (for empirical evidence, see Chapter IV). The existence of a free public library means that a child's reading is not governed by the willingness of his parents to buy or rent books. That is, for the same reason that the community is willing to subsidize education, it is willing to subsidize library services for children (Goddard 1970). Individuals may or may not be willing to subsidize the reading of other adults, but they are likely to be willing to pay something so that children can read to the extent they desire. If this rationale is correct, less weight should be placed on user demands for juvenile books relative to adult books, and more weight should be placed on acquiring books that children "ought" to read.

The model described below is user-oriented rather than supplier-oriented. We chose to develop this kind of model for some of the reasons given above by those advocating a user orientation, particularly those stressing (a) that availability of a book doesn't imply its use and (b) the difficulty of defining tastes and knowing which books will elevate them.[4] Moreover, if the librarian's own tastes are what is relevant, there is no analytical problem in selecting books; the librarian can confidently select those which she feels are best.

Fortunately for our purposes, the conflict between the two approaches may be more apparent than real. Although the model we have developed (based on user demand) could be applied conceptually to any individual book, in practice it has been applied to reasonably homogeneous *classes* of books; that is, the model is used to determine whether the library should buy more books on, say, Psychology and fewer books on Linguistics, or more Mysteries and less General Fiction (see Chapter III). Within a class, however, the librarian must still make a choice: she will presumably select those books that she feels users will find most valuable. Nevertheless, it seems appropriate to base acquisition policy among classes on actual demand for two

[4] The availability-does-not-imply-use argument may be restated to some extent. Book selection implied by the user-oriented concept responds to actual demands, but book selection implied by the supplier-oriented concept can be thought of as responding to what might be called latent demand (Acton 1970). Latent demands are those preferences that the individual would express if he had complete information; thus, the librarian should use her information about books to select those that the reader would agree, after reading them, were the ones he wanted. (There is a similar argument for compulsory education and prohibitions on drug consumption. After receiving the education (drugs), the individual will be happy (unhappy) that he consumed.) Actual demands, however, may not be that different from latent demands for those books that are read; that is, most readers probably select books to read that they are satisfied with after having read them. If the reader does not think he will be satisfied later, he does not select the book. (And if a book does not suit his taste—if it is too technical, contains too many four-letter words, does not contain enough four-letter words—he may select the book but quickly put it down.) Thus, a program to elevate tastes may not be very successful.

reasons. First, reading books, say, on Psychology appears to be no more or less uplifting than reading books on Linguistics. Second, the nonuse argument seems particularly cogent. Many users of the book collection probably want either a specific book or a book in a specific class (for example, a novel, a mystery story, a book on gardening). If so, books in another class, which the librarian may have purchased to elevate the community's tastes, will not affect the reader's choice; he will just ignore them. While it may be something of an exaggeration to suppose that he will completely ignore whole classes of books simply because he did not come to the library to obtain books in them, we believe that the supposition is accurate enough to justify basing book selection among classes on actual demands. For example, many persons will not check out Physics books (or Mysteries), no matter how large the collection in these classes. If this is correct, *those book classes should be selected which the community values most highly;* that is, *given a book budget, book selection should maximize benefit to the community.*

THE BOOK-SELECTION MODEL: A NON-TECHNICAL DESCRIPTION

In this section we will attempt to explain our book-selection model in non-technical terms for those readers who do not have a technical background in economics. Since the explanation is of necessity somewhat incomplete, we will also provide a technical description in the next section, which some readers may wish to skip or skim lightly.

Our book-selection model attempts to maximize the benefit the library provides to the community for a given-size book budget. The first problem one encounters in doing so is that there is no obvious way to measure the benefits provided. Economics, however, provides assistance. Generally, the economist measures benefit by measuring the value of some good (or service) to an individual in terms of what other goods and services he will give up to obtain it. In other words, value is relative. Consequently, one needs a unit of value, that is, a good with which other goods are compared. This good is usually taken to be money, but such a good could equally well be apples or peanuts. That is, an individual may be willing to give up two apples to read a certain book, but he may be willing to give up four apples (or, if apples are 10 cents apiece, 40 cents) to read another. The library makes any given individual best off by buying those books for which he would be willing to give up the greatest amount of other goods, that is, to pay the most. It may make the book available at no charge, of course; but in comparing two book lists to determine which it should purchase, as far as a given individual is concerned, the library should buy that list for which the person is willing to pay the most.

Using willingness-to-pay gives us a measure of benefits, but it is not obvious that benefits supplied to different individuals are comparable. Suppose, for example, that both individual A and individual B value one book list at $10 and another at $5. Further, suppose both book lists cost the library the same amount of money. If it must choose between those two lists, and if A and B are the only relevant individu-

als, it should clearly choose the first book list. But now suppose that individual A values the first list at $20 and the second list at $5, and that individual B values the first list at $5 and the second list at $10. Then there is a problem. The total value to the community of one list is $25 and of the other, $15; but if we took a vote, each list would receive one vote. The problem occurs because, in effect, we have two voting schemes; if individuals vote with dollars, the first book list wins, but if each has only one vote, there is a tie. This problem is an old one, and has generated much literature in the theory of social choice.

The solution we have adopted is that of letting individuals vote with dollars. Thus, in the example above, the library would buy the first list. The advantage of this method is that it takes into account differences in the intensities of preferences. For example, individual A may feel that one book list is much superior, while individual B may feel that the lists are almost, but not quite, the same. By voting with dollars, we can take account of these differences.

The problem that arises in voting with dollars is that dollars may be badly distributed among individuals (by an ethical standard); that is, it may be felt that in selecting books, the tastes of the rich should not count more than the tastes of the poor, which will tend to happen if voting is with dollars. We have chosen to ignore this objection because public libraries generally serve a rather homogeneous population; in smaller towns, such as Beverly Hills, where there is one library, decisions made on the basis of dollar votes should not differ very much from those made on the basis of one vote per person if intensities of preferences are similar. And in larger cities, such as Los Angeles, where the population is heterogeneous, the library system is usually composed of branch libraries serving a rather homogeneous local neighborhood. In such cases, the model should be applied to book selection at each branch, given its book budget. The size of the book budget of each branch must be determined on other grounds, namely on how deserving residents of one area are relative to those of another, and on how much residents of various areas value library services. Similarly in Beverly Hills, the size of the book budget must be determined on the basis of how much the citizens value library services relative to police, fire, and other municipal services, as well as private goods. Although the model to be developed is relevant in determining the size of the book budget, we assume that the book budget has already been decided (and in a larger system, allocated among branches), and that the question is how best to spend it. Within this context, the use of dollar votes seems appropriate.

Having decided to use dollar votes, the next problem is how to measure the amount of money members of the community will pay for various book lists. Let us begin with the case of an individual book. Presumably the most any borrower would pay for the book is its purchase price, since he always has the option of purchasing the book in a bookstore.[5] We assume that those library users who would otherwise have bought the book will pay on the average some fraction of the purchase price to borrow the book from the library. In addition to these users, the library may serve

[5] Of course, it takes time and trouble to go to a bookstore, but it also takes time and trouble to go to the library.

some readers who would not buy the book, but would borrow it from the library if the library owned a copy. These people presumably would pay something for the privilege of borrowing the book, but would not pay the purchase price. We assume that the distribution of the amount that these readers might pay is uniformly spread from the amount that the first type of borrower would pay to zero. This means that there are as many readers who would pay 5 cents to read the book as would pay 10 cents, or any other amount up to a fraction of the purchase price. This assumption takes us a good part of the way to our model.

Finally, we must take account of readership over the life of the book. Some books will be greatly in demand this year and not at all in the future; these books must recoup their purchase price in circulation benefits in the present or they are not worth buying. Other books will continue to circulate; and because they will continue to provide benefits, we must have some way of comparing future benefits with present benefits. Since money received now can be set aside to earn interest, it is more valuable than money received in the future. Hence, the money benefits of circulation tomorrow must be "discounted" by the relevant interest rate to make them commensurate with money benefits of present circulation.

We thus have an assumed distribution of the community's willingness to pay for a book that depends on: (1) the price of the book; (2) the number of borrowers who would pay full price for the book if the library did not have it and the number who would pay less than the full price; (3) a correction factor that must be applied, since the borrower does not own the book. (The correction factor is the fraction of the purchase price that a borrower who would otherwise have bought the book would pay to borrow it.) Each circulation of the book can be thought of as providing benefits equal to a random drawing from this distribution of willingness to pay. The average benefit of a number of circulations should be approximately the mean of this distribution. In addition, we must make the appropriate correction for the time profile of book circulation (that is, discount future circulation). Then we can state our criterion: The library should choose books so as to maximize an appropriately weighted and discounted stream of circulation, where the weights depend on price and the other factors mentioned above. Note that this criterion makes the selection of library books depend on the demand for a book *at the library*, not for the book elsewhere. If demand for a particular book is high, the chances are that it will also be in demand at the library, but the correlation will not be perfect. This obvious point seems to be overlooked in the literature.

THE BOOK-SELECTION MODEL: A TECHNICAL DESCRIPTION

If the aggregate demand curve for each library book could be measured, it would be a relatively simple task to determine which books the library should buy. Ignoring distributional considerations, it should buy those books whose appropriately discounted benefit stream over the life of the book is greatest, where benefit in any period can be approximately measured by the area under the income-compensated

demand curve. That is, suppose q_L is the quantity of a particular library book demanded in a given period. It is a function of the price of using the library for this book, p_L, the price of the book, p_B, and x, a vector of other variables,

$$q_L = f\,(p_L, p_B, x). \tag{2.1}$$

The price of using the library, p_L, will be only the costs of time and travel, unless the library imposes fees. There are certain complications, such as possible nonprice rationing of the library book; but ignoring those complications, we could, if we knew the demand curve, measure benefit in the usual fashion, as

$$\int_0^{\bar{q}_L} f^{-1}\, dq_L,$$

where $\bar{q}_L$ is the quantity demanded at the existing price $\bar{p}_L$.

Unfortunately, such a demand curve is impossible to measure because preferences for library books are never revealed in the marketplace unless the library is willing to experiment with a fee schedule. This, of course, is the usual problem of publicly supplied goods. However, the benefit from publicly provided goods that are close substitutes for goods that can be purchased on the market can be approximately measured by using the demand curve for the private good, a demand curve that is not only measurable but frequently not too difficult to measure. Further, in the case of the library, it will turn out that the theory can be implemented without actually measuring any demand curve.

Suppose we write the demand curve to purchase a book as:

$$q_B = g\,(p_L, p_B, y), \tag{2.2}$$

where q_B = quantity of book demanded,
p_L = price of using book at library,
p_B = price of book,
y = vector of other variables.

Two such demand curves are shown in Fig. 2.1. OF is the price of the book. The outer demand curve, CD, is the demand curve for the book if the library does not buy an additional copy of the book; AB is the demand curve if it does. Thus, if the library buys an additional copy, the availability of the book at the library will increase, p_L will fall, and AC fewer books will be bought. Let us call those who would have bought the book if the library had not purchased it, Type A borrowers. Type B borrowers are those excluded by the price of the book;[6] they are willing to borrow the book from the library because they will pay more than p_L to read it, but they are unwilling to buy it. The most Type A borrowers will pay to borrow the book is

[6] Edmund Brunner has pointed out that a Type C borrower may exist: one who will read a book in the library and then buy it. This reader is receiving a service whose value we are not measuring, but it should not affect the book-selection theory very much. See page 13.

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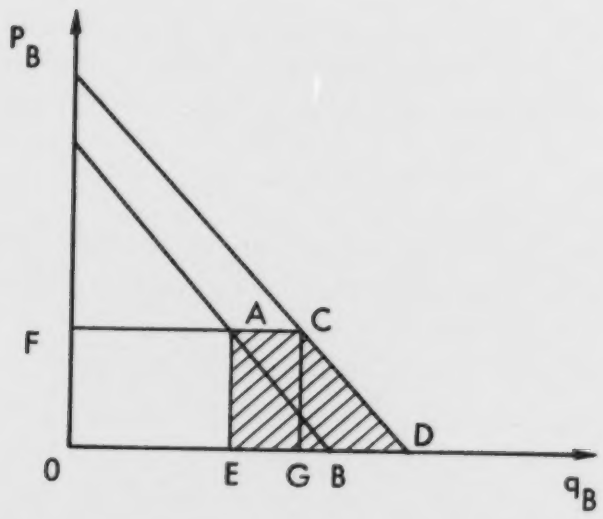

Fig. 2.1—Demand curve for the purchase of books

the price of the book; Type B borrowers will pay at most something less. Hence, an upper bound on the benefit that could be provided the community by having the book available at the library is the shaded area ACDBGE.[7] Note that, other things being equal, the shaded area is larger: The more elastic the demand curve at C, the greater the price of the book, and the greater the shift of the demand curve when the library buys a copy. The area is *not* increased by a simple shift outward in both demand curves.

Before establishing a decision rule for libraries, we must take account of some qualifications. First, trips to the library cost something in time and money, and individuals have different values for time. Likewise, the marginal cost of obtaining a second book from the library is small if one is making a trip for another book. Neither of these considerations should seriously affect the theory, however. So long as the tastes of individuals in books are not correlated with the cost to them of using the library, or with propensities to check out more than one book, the effect of such transaction costs is like a lump-sum tax on the total benefit the library is providing the community.[8] It should not affect the relative desirability of various books and periodicals.[9] We ignore costs of using the library in what follows.

Second, not all of those who demand the book can use it at the same time. Some users' reading must be deferred. Hence a discount factor should be applied to the benefits supplied to those individuals whose reading is deferred. There is more to the problem than that, however. Time will also affect what an individual will pay to

[7] It would be theoretically better to compare the library with a more similar service, the book rental market. However, data from book rentals are not as easily available to the library as data on book prices.

[8] The amount of the tax might be reduced by a different location policy. See Shishko and Raffel (1971) for a discussion of library location policy.

[9] If those with a high value for time prefer, say, books on Art, and those with a low value for time prefer, say, Mysteries and Westerns, our measure of benefit will understate the value of Mysteries and Westerns.

have the services of the book. Some books have a fad value; the value one places on reading last year's best seller may be much lower this year. Other books, such as reference works, are different; even if one has already used a reference book in the past, it may continue to be useful in the future. In short, although some books depreciate very rapidly, others do so much more slowly. Thus, an individual's demand for the services of a book in future time periods will depend on (a) whether or not he has read the book; (b) what type of book it is.

One of the services that the library provides for its users is information about the book market, since the library provides a convenient means of finding out which books are available, what a particular author's style is like, etc.[10] This service—which we do not evaluate here—increases the benefit that the community receives from the library. Still the theory of book selection should not be greatly affected unless some classes of books provide more information about the book market than others.[11]

On the assumption that the borrower of the book gets some fraction b_i of the benefits of ownership, we can approximately measure the benefit which the ith library book provides the community in time period t as

$$B_{it} = a_{it}b_ip_{it}q_{it},$$

where a_{it} is a fraction between ½ and 1, which reflects the proportion of Type A borrowers to Type B borrowers (a_{it} is 1 if all borrowers are Type A borrowers, ½ if all borrowers are Type B borrowers and the demand curve is linear), b_i is as defined above, p_{it} is the price of the book, and q_{it} is the circulation of the book. If a_{it} and b_i are constant across books, the library's decision rule is particularly simple: maximize discounted weighted circulation (using price weights) for any given book budget subject to distributional constraints. (Why it may be useful to take account of distributional constraints can be illustrated by the following problem: If circulation does not fall as holdings of one type of book increase, the entire book budget might be spent on one type of book—for example, Mysteries; in the absence of compensation, those who didn't read that type of book would be worse off. Thus, some constraints to ensure that the library spends a certain amount in each area are reasonable.)

Unfortunately, a_{it} and b_i are likely to differ among books, which means that estimates of their values are necessary to implement this decision rule. Consider first a_{it}, the proportion of borrowers who would buy the book if the library did not own it. For very high-priced reference books, relatively few readers are likely to purchase the book even if the library does not; consequently, a_{it} is likely to be near ½. For a popular novel that is available in paperback, a_{it} may be near 1. Likewise, b_i, the fraction of benefits that a borrower obtains relative to an owner, will probably be smaller for the expensive reference book. For the popular novel, the owner is

[10] This is the product the Type C borrower receives.

[11] Since a larger collection of books may well provide more information than a smaller collection, the criterion developed below (which ignores this point) undervalues cheaper books. The bias seems small, however, and so can be ignored.

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likely to read it once, put it down, and seldom, if ever, pick it up again. The additional benefits he receives relative to the borrower would consist of little more than pride of ownership. An expensive reference-type book, however, may be consulted several times; then, if there are significant transactions costs in using the library, the book that is used several times at the library will provide a smaller fraction of the purchase price in benefits in any one usage than books that are used only once. (That is, assume purchase price of two books is the same. If one book is expected to be used a sufficient number of times and transactions costs are significant, the reader will buy it. Hence, those who don't buy a book they use several times are likely to place a lower value relative to the purchase price for each usage than those who borrow a book only once.)

Our measure also assumes that the demand curve is linear, so that Type B borrowers would pay on the average ½ $b_i p_i$ to borrow the book. This does not seem unreasonable. We also assume that the order of borrowing is random. However, those to whom the book is worth more may have a stronger incentive to borrow the book from the library. Hence, initial borrowers would be disproportionately concentrated in the left-hand portion of the shaded area of Fig. 2.1. If so, because the benefits of later borrowers are more heavily discounted, this would mean that the above benefit measure is slightly downward biased.

To make this criterion operational, we redefine i to be an index of book types and then have the library choose B_i to maximize

$$\sum_t \sum_i a_{it} b_i p_{it} q_{it} / (1 + r)^t$$

subject to

$$q_{it} = c_{it} B_i, \qquad \sum_i p_i B_i \leq B, \qquad B_i \geq Q \geq 0,$$

where a, b, p, and q are as defined above, r is the discount rate, B_i is the number of books of type i bought with the current book budget, c_{it} is the fraction of books bought of type i which circulate in time period t, B is the current book budget, and Q is the vector of minimum additions to holdings, which are based on distributional considerations.

IMPLICATIONS OF THE MODEL FOR BOOK SELECTION

The effect of this decision rule is that the library will tend to buy books that are expensive and that circulate frequently. To be precise about "expensive": in general, as price rises, the size of the area CAEGBD in Fig. 2.1 will increase rapidly. For straight-line demand curves, other things being equal, the increase will always be greater than the increase in p up to the point where the demand curve intersects the price axis (the demand curve would have to depart considerably from a straight

line for this not to be true); thus, the net benefit will be greater for higher-priced books. In practical terms, this means the library should not necessarily buy best selling books, since an equal shift in both demand curves will not increase the area CAEGBD (it should, however, buy books that circulate frequently); also, it should tend not to buy books that will later be published in paperback (when the paperback edition comes out, the size of the area will diminish).

Some other guidelines provided by this model are as follows:

1. The library can increase its benefits to the community by charging a fee to reserve a book, thereby increasing the probability that those who place the greatest value on the book will read it first (ignoring distributional considerations). The larger discount factors will be applied to the lesser benefits. Also, the possibility of reservation by paying a fee reduces the probability of wasteful trips or calls to the library to obtain or inquire about a book that is not in.
2. The library should not accumulate books, but should sell off some older books whose circulation has dropped off. By using the proceeds from the sale to buy new books, the library may be able to increase the benefit it provides.[12]
3. Except for the above-mentioned reserve charges for books that are greatly in demand, prices to use the library should be low or zero. A fee to borrow may deter some borrowers; if no one else wants to borrow the book, the potential borrower is worse off and no one else is better off. However, insofar as there are administrative costs in loaning books, which increase with the number of books borrowed, a fee can be justified.
4. Fines for not returning books on time should reflect demand for the book. Theoretically, no fine should be imposed for a book that is not demanded; but, since it is difficult to know that a book is not demanded, some small fine for lateness may be justified based on the assumption that any book on the shelf might be demanded. Also, keeping a book beyond its due date may raise the possibility of its loss. For books that are known to be demanded, however, fines should be higher.

COMPARISON OF THE BOOK-SELECTION MODEL WITH AMERICAN LIBRARY ASSOCIATION STANDARDS

The current standards of the American Library Association for public libraries have been changed to a considerable degree from the standards which Leigh was addressing in the Public Library Inquiry in the quotation at the beginning of this chapter. The standards now state:

[12] Likewise it may be able to buy second-hand books profitably.

> All materials should be selected and retained or discarded in keeping with stated objectives of each system. Within the broad purposes listed above, each library should define and refine the objectives it seeks to achieve. Systems and libraries within systems must define aims toward which they will build their collections, or aims will be defined for them by default in what they fail to acquire. Emphasis in collections will change from time to time to clarify emerging issues, and as communities change and face new problems. . . . Every system and every library within the system should have a written statement of policy. . . .
>
> Materials acquired should meet high standards of quality in content, expression, and form.
>
> Within standards of purpose and quality, collections should be built to meet the needs and interests of the people. Systems of libraries, both the community library and the headquarters unit, exist to serve their constituents. Materials are added because they serve agreed purposes, meet quality standards, and are of interest to readers and to organizations. Selection follows from conscious study of the needs of all groups. . . . Sensitivity to interests, early recognition of needs before they are clearly expressed, and catholicity of contact and viewpoint mark the librarian who keeps the collection in tune with its public. Selection must go beyond the requests of particular groups who have come to use the library regularly, and must appeal to segments in the population which do not as readily turn to it. The needs of the various age and interest groups in the community should be reflected in the library's annual budget allocations for resources and in the continuing selection of materials to meet their needs. (American Library Association, 1967, pp. 37-38.)

The report provides no advice to the library on how to define its standards, on how to weight the interests of various users of the library, or on how to recognize needs "before they are clearly expressed."

We suggest that our book-selection model is compatible with these standards, *provided that one accepts the assumptions of the model as appropriate objectives.* To restate the most important assumption: The library should choose that mix of books for which its users (or potential users) would pay the most money, since it is that mix that provides them with the greatest benefit. The benefits are measured in terms of value to the individual user; whatever he wants most, for whatever reason, the library is to supply. (An exception may be made for juvenile books. Since the juvenile library may be partly supported for educational purposes, it should purchase books that to some degree carry out these purposes rather than books that users of the juvenile library demand.)

An objection may be that this criterion ignores the standards of literary taste. This objection is true to some extent; the library is viewed as an institution for satisfying the wants of the public, whatever they happen to be. However, our book-selection model has been applied to *classes* of books. Within a class, the librarian is free to apply literary standards (and a moment's reflection may convince the reader

that literary standards are really meant to apply to choice within a class, not to choice among classes). We now turn to the problems encountered in applying the model.

III

THE BOOK-SELECTION PROBLEM: IMPLEMENTATION OF THE MODEL

IN ATTEMPTING TO ADAPT THE BOOK-SELECTION MODEL for actual use at a library, we encountered a number of problems: book classes had to be defined; demand had to be estimated; and measures of intensities of preference had to be developed. This chapter describes how these problems were solved, and the resulting benefit per dollar for various classes of books.

DEFINITION OF CLASSES

Although, conceptually, the book-selection model could be applied to individual books, we have not done so. In order to estimate the circulation of books that the library could buy, and the proportion of borrowers who would buy the book if the library did not purchase it, we have divided the book collection into classes of books. A class is a group of books sufficiently homogeneous so that if a librarian decides to increase or decrease purchases in the class, the statement is relatively easy to interpret, as, for example, if she decides to buy more "Biographies." Of course, it would be better to specify books in still greater detail, such as "Biographies of twentieth century American composers," but the cost of providing such fine disaggregation is relatively great. At the same time, the class "Biography" is more interpretable than the class "books with a Dewey Decimal classification in the 900s," since the 900s include Geography, Travel, and History, as well as Biography.

Initially we defined 49 classes of books and further subdivided each of these into two classes according to whether the book was published in 1966 or later. The subdivision by date of publication was an attempt to correct for differential declines

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over time in circulation of various classes of books. Ideally one would have data on circulation by class by year, so that time profiles for each class could be established. Such information would have required a larger and more costly sample; we therefore chose this less exact correction.[1] The resulting error should not be large.

The 49 classes (and associated Dewey Decimal Numbers) we used are shown in Table 3.1. The classes were made up in consultation with librarians at the Beverly Hills Public Library and reflect the composition of the collection at Beverly Hills as well as the librarians' conception of what, to them, constituted meaningful groupings.

To establish demand for each class of books, we have followed the circulation of 1208 titles (1339 volumes) for nearly 1 year. The 1208 titles represented a systematic sample (with a random start) from the shelf list of the library.[2] There were 1451 titles in the original sample, of which 1208, or somewhat more than 1 percent of the titles in the library, were found. Each book that was found on the shelf was tagged with an identifying mark, and each book that was checked out at the time was tagged when it was returned.[3] Each time that a tagged book circulated, the dates on which it went out of and came back into the library were recorded.

The percentage of titles in the sample in each class and the percentage eventually found are shown in Table 3.1. For example, of the 1451 titles in the sample, 0.8 percent were General Reference books that circulated and that were published before 1966. This is the best estimate of what percentage of the collection is in this class. Ninety-one percent of the volumes sampled in this class were found. Because of the small number of books in some classes, a number of the estimates are subject to substantial sampling error. The age of the library's collection is clearly evident; the last line of the table shows that nearly 80 percent of the titles were more than 4 years old at the time of the sample. The largest class of books is General Fiction and Short Stories; it accounts for 13.2 percent of the collection. The other large classes are Juvenile Nonfiction, which comprises 12.8 percent of the collection; History, 9.8 percent; Biography, 7.0 percent; and Sociology, Economics, and Political Science, 6.8 percent. These five classes comprise 50 percent of the collection.

A considerable number of volumes are missing. (Missing means that the library thought the book was on the shelf or circulating, but it was not.)[4] Because of the small sample size in some classes, the estimate of the number of volumes missing in any particular class is not always reliable; however, assuming that books that were checked out at the time of the sample were eventually included, we can be fairly certain that for the entire collection, 19.0 percent of the books are missing.[5] Of the books published in 1965 or before, 20.2 percent are missing; of those published

[1] An alternative method to establish time profiles would have been to apply Morse's Markov model of circulation as a function of time to each class of books (Morse 1968). The reason this was not done was that it required time series data on the circulation of individual books. Since we only had a chance to observe circulation for slightly less than a year, Morse's approach did not seem practical.

[2] A systematic sample selects every *n*th book in the collection, beginning randomly in the first n books.

[3] This created a slight bias against those books that circulate more frequently, since we did not give credit for the partial initial circulation.

[4] Note that in measuring the percentage missing we have changed units from titles to volumes.

[5] This figure may well be high. See Chapter VII.

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Table 3.1

SYSTEMATIC SAMPLE: THE BEVERLY HILLS COLLECTION

Book Class	Number of Titles in Sample, Published Before 1966	Percentage of Sample	Percentage of Volumes Found	Number of Titles in Sample, Published 1966 or After	Percentage of Total Sample	Percentage of Volumes Found	Dewey Decimal Numbers or Beverly Hills Symbols
1. General Reference, circulating	11	0.8	91	0	0	-	000-099, 310, 312-319
2. Philosophy	10	0.7	82	0	0	-	100-129, 140-149, 160-199
3. Occultism	1	0.1	0	0	0	-	133, 135.4, 138, 139
4. Psychology	10	0.7	58	4	0.3	100	131, 132, 134, 135.3, 136, 137, 150-159, 649
5. Religion, except Judaism	13	0.9	69	9	0.6	100	200-295, 297-299
6. Judaism	2	0.1	100	1	0.1	100	296
7. Sociology, Economics, Political Science	72	5.0	92	26	1.8	86	300-309, 320-369, 380-399, 711
8. Education	6	0.4	83	6	0.4	86	370-379
9. Linguistics	5	0.3	80	3	0.2	100	400-499, 803
10. Mathematics and Statistics	2	0.1	100	2	0.1	100	311, 510-519
11. Physical Sciences	10	0.7	77	1	0.1	100	520-549
12. Life Sciences	19	1.3	95	5	0.3	100	550-599
13. Engineering and Technology	13	0.9	92	6	0.4	86	600-609, 620-629, 660-699
14. Medicine	10	0.7	80	6	0.4	100	610-619
15. Care and Training of Animals	3	0.2	67	0	0	-	636-639
16. Food and Cooking	5	0.3	80	2	0.1	50	641, 642
17. Home Economics, except Food and Cooking	3	0.2	67	0	0	-	640, 643-648
18. Business Skills	10	0.7	80	2	0.1	100	650-659
19. History of Art (Art Appreciation)	26	1.8	82	4	0.3	100	700-709, 730.9, 732-736, 738.2-738.9, 739.2-739.9, 741.09, 741.9, 741.59, 745.44, 748.29, 748.59, 753-759, 769.00-769.54, 769.57-769.99, 779
20. Horticulture and Gardening	4	0.3	75	3	0.2	100	630-635, 712-719, 745.9,
21. Architecture	7	0.5	100	1	0.1	100	720-729
22. The Arts (Emphasis on Technique)	13	0.9	93	2	0.1	100	731, 738.1, 739.1, 740, 741.00-741.08, 741.1-741.58, 741.6-741.89, 742-744, 745.00-745.43, 745.45-745.89, 746, 750-752, 760-768, 770-778
23. Interior Decoration	2	0.1	100	1	0.1	-	745.1, 747, 748.00-748.28, 748.3-748.58, 748.6-748.9, 749
24. Music	34	2.3	78	2	0.1	50	780-789 (including scores)
25. Hobbies and Indoor Recreation	4	0.3	75	0	0	-	737, 769.55, 769.56, 790, 793-795
26. Athletics and Outdoor Recreation	6	0.4	100	3	0.2	100	796-799
27. Entertainment	5	0.3	100	3	0.2	50	791, 792

Table 3.1--*continued*

Book Class	Number of Titles in Sample, Published Before 1966	Percentage of Sample	Percentage of Volumes Found	Number of Titles in Sample, Published 1966 or After	Percentage of Total Sample	Percentage of Volumes Found	Dewey Decimal Numbers or Beverly Hills Symbols
28. Literature and Rhetoric, not elsewhere classified	53	3.7	90	7	0.5	100	800-802, 804, 807, 808.0, 808.4, 808.6, 808.7, 808.80, 808.84-808.99, 809.0, 809.4-809.9, 810, 814-820, 824-830, 834-840, 844-850, 854-860, 864-870, 874-880, 884-890, 894-899
29. Poetry	28	1.9	67	4	0.3	100	808.1, 808.81, 809.1, 811, 821, 831, 841, 851, 861, 871, 881, 891
30. Drama	34	2.3	53	6	0.4	83	808.2, 808.82, 809.2, 812, 822, 832, 842, 852, 862, 872, 882, 892
31. Fiction classified in the Dewey Decimal System	5	0.3	100	5	0.3	80	808.3, 808.83, 809.3, 813, 823, 833, 843, 853, 863, 873, 883, 893
32. Public Speaking	5	0.3	80	2	0.1	50	808.5
33. Geography and Travel	13	0.9	69	8	0.6	100	900-919
34. Biography	92	6.3	86	10	0.7	100	920-929 (including Beverly Hills 92 series)
35. History	121	8.3	81	222	1.5	75	930-999
36. General Fiction and Short Stories, not elsewhere classified	151	10.4	81	40	2.8	90	Books with no symbol and S
37. Juvenile Fiction	62	4.3	75	14	1.0	88	(Beverly Hills symbol J)
38. Juvenile Non-fiction	152	10.5	87	34	2.3	90	(Beverly Hills prefix J)
39. Juvenile Teenage Fiction	11	0.8	50	9	0.6	78	(Beverly Hills symbol JT)
40. Preschool Fiction	31	2.1	48	9	0.6	22	(Beverly Hills symbols PJ, PJE, PJX, RJE)
41. Young Adult Non-fiction	21	1.4	86	4	0.3	100	(Beverly Hills prefix Y)
42. Young Adult Fiction	9	0.6	67	2	0.1	100	(Beverly Hills symbol Y)
43. Westerns	4	0.3	75	2	0.1	50	(Beverly Hills symbol W)
44. Mysteries	18	1.2	67	13	0.9	73	(Beverly Hills symbol M)
45. Science Fiction	2	0.1	0	2	0.1	-	(Beverly Hills symbol SF)
46. Preschool Non-fiction	6	0.4	43	9	0.6	91	(Beverly Hills prefix PJ)
47. Recordings	8	0.6	73	1	0.1	100	
48. French Language Books	13	0.9	(a)	1	0.1	(a)	(Beverly Hills symbol F)
49. Foreign Language Books, other than French	10	0.7	(a)	0	0	(a)	(Beverly Hills symbols G, RU, S; 7 German, 1 Russian, 2 Spanish of the 10 books)
Total	1155	79.6	79.8	296	20.4	85.7	

[a]These classes were not included in the circulation sample through oversight and thus percentage of volumes found cannot be determined.

after 1965, 14.3 percent. Science Fiction and Preschool Fiction appear to be the classes having the highest rates of disappearance, although the small number of volumes in Science Fiction makes this estimate subject to large sampling error. We comment on the significance of these figures for security systems in Chapter VII.

Because of the small number of titles that were found in particular classes, some aggregation was necessary to obtain estimates with plausible sampling variances. We have made two different aggregations. In one, the minimum number of titles in a class is three; in the other, more aggregated analysis, the minimum number of titles in a class is ten. The latter analysis, of course, is more reliable, but the reliability is purchased at the price of more aggregated and hence less helpful classes of books. The resulting aggregations are shown in Tables 3.2 and 3.3. When there were fewer than the required number of titles in either the before or after 1966 class, the two classes were combined. The number of titles differs from that of Table 3.1 because titles not found are excluded from Tables 3.2 and 3.3.

In preparing Table 3.2, four classes had to be dropped because the books were not found: Occultism, Science Fiction, and the two Foreign Language classes. Three other classes were combined: Care and Training of Animals with Hobbies and Indoor Recreation; Food and Cooking with Home Economics except Food and Cooking; and Interior Decoration with Art Techniques.[6] Twenty classes had too few books to make an assessment of decline in circulation over time (that is, there were too few books of the class in the sample from before or after 1966 or both). In these classes we have combined the books published before and after 1966. This does not cause a problem if demand for the books is independent of date of publication or if publication dates in our sample reflect the future probabilities of retirement for a new book. As we shall see below, the first assumption does not hold; demand for books published in 1966 or later is more than three times the demand for books published before 1966. The second assumption does seem reasonable: It is plausible to suppose that the proportion of books t years old which leave the collection each year is relatively constant over time. In other words, we can assume that, on the average, demand for a new book in a certain class t years from now can be represented by demand today for a book in that class that is t years old.

Each year a certain number of books are lost or retired. Expected circulation of a new book must take this into account. If the sample is distributed in accordance with the future probabilities of loss or retirement, it will satisfy the usual conditions for aggregation (Theil 1954). The rules for treating the books published before 1966 (or after 1966) as one class, of course, are the same. That is, we can assume that all books published before or after 1966 are either equally demanded or have been retired at a rate that will continue to prevail. The first assumption seems more likely to hold in this case than in the classes where we have combined books published before and after 1966.

[6] The reader may wonder why a stratified sample was not employed and certain categories oversampled. This would no doubt have been preferable; however, since the proportion of books in each class was unknown, it would first have been necessary to conduct a systematic sample and then sample further. The time constraints involved in setting up the data collection system did not make it practical to do this, since to have done so would have seriously reduced the already small number of time periods available to estimate the demand rates for various classes of books.

Table 3.2

AGGREGATION OF BOOK CLASSES SHOWN IN TABLE 3.1

Minimum of Three Titles per Class

New Class[a]	Number of Titles in Class		
	Published Before 1966	Published 1966 or After	Combined
Reference, circulating			10
Philosophy			9
Psychology	7	4	
Religion, except Judaism	10	8	
Judaism			3
Sociology, Economics, Political Science	66	23	
Education	5	5	
Linguistics	4	3	
Mathematics and Statistics			4
Physical Sciences			9
Life Sciences	18	5	
Engineering and Technology	12	5	
Medicine	8	6	
Animal Care and Hobbies			5
Cooking and Other Home Economics			7
Business Skills			10
Art Appreciation	22	4	
Horticulture and Gardening	3	3	
Architecture			8
Art Techniques and Interior Decoration			16
Music			27
Athletics and Outdoor Recreation	6	3	
Entertainment			6
Literature and Rhetoric, not elsewhere classified	49	7	
Poetry	19	4	
Drama	22	5	
Fiction, classified in the Dewey Decimal System	5	4	
Public Speaking			5
Geography and Travel	9	8	
Biography	80	10	
History	106	18	
General Fiction and Short Stories, not elsewhere classified	134	38	
Juvenile Fiction	52	12	
Juvenile Nonfiction	137	32	
Juvenile Teenage Fiction	8	7	
Preschool Fiction			19
Preschool Nonfiction	3	8	
Young Adult Fiction			8
Young Adult Nonfiction	18	4	
Westerns			4
Mysteries	12	11	
Recordings			6
Total, Before 1966			975
Total, 1966 or After			233
GRAND TOTAL			1208

[a]Occultism, Science Fiction, and Foreign Language books have been dropped because no books were found in these classes.

Table 3.3

AGGREGATION OF BOOK CLASSES SHOWN IN TABLE 3.2

Minimum of Ten Titles per Class

New Class	Number of Titles in Class: Published Before 1966	Number of Titles in Class: Published 1966 or After	Number of Titles in Class: Combined	Classes from Table 3.2 Included
Reference, circulating			10	
Philosophy and Religion			30	Philosophy, Religion, Judaism
Psychology			11	
Sociology, Economics, and Political Science	66	23		
Education			10	
Mathematics and Physical Sciences			13	Mathematics, Physical Sciences
Life Sciences			23	
Engineering and Technology			17	
Medicine			14	
Recreation			38	Animal Care and Hobbies, Athletics, Cooking and Other Home Economics, Horticulture and Gardening, Entertainment, Public Speaking
Business Skills			10	
Art Appreciation			26	
Art Techniques, Architecture, and Interior Decoration			24	Art Techniques, Architecture, Interior Decoration
Music and Recordings[a]			33	Music, Recordings
Literature and Rhetoric, not elsewhere classified, and Linguistics			63	Literature and Rhetoric, Linguistics
Poetry			23	
Drama			27	
Geography and Travel			17	
Biography	80	10		
History	106	18		
General Fiction and Short Stories	141	44		General Fiction and Short Stories, Fiction classified in the Dewey Decimal System, Westerns
Juvenile Fiction	52	12		
Juvenile Nonfiction	137	32		
Juvenile Teenage Fiction and Young Adult Fiction			23	Juvenile Teenage Fiction, Young Adult Fiction
Preschool Fiction			19	
Preschool Nonfiction			11	
Young Adult Nonfiction			22	
Mysteries	12	11		

[a]The nine recordings include one spoken record.

In Table 3.3, where each class has a minimum of ten books, more classes have had to be combined. Of the original 49 classes, only seven have ten books or more published both before and after 1966. Further, a number of classes have already been combined, so that the total number of classes is now 28.

MEASURING DEMAND FOR LIBRARY BOOKS: ACTUAL CIRCULATION

Central to the model of book selection is a measure of the demand for library books, because it is demand, appropriately weighted and discounted, that we wish to maximize. Since unsatisfied demand generates no benefits, it is really satisfied demand that we want to maximize. The simplest and most straightforward measure of satisfied demand is actual circulation. We have computed the number of circulations in our sample per volume per 2-week loan period for each class of books and show the results in Tables 3.5 and 3.6 on pages 30 and 32. In all, there were 23 2-week periods in our sample, and the 1208 titles circulated 2542 times, an average of 0.0913 circulations per title per 2-week period. On the average, then, there was a circulation of each title every 24 weeks. Circulation per period per title published before 1966 was 0.0630, but it was 0.1652 per title published in 1966 and after. The circulation ratio of books published in 1966 and after to those published before 1966 is 2.62, which is approximately what Raffel and Shishko found for books in the M.I.T. Library (computed from Raffel and Shishko 1969, Fig. 5).

Mysteries, recent General Fiction (adult), and recent Psychology are the classes that circulate most frequently, though these will not necessarily be the ones with the largest benefit/cost ratios. Unfortunately, there is a sizable amount of uncertainty surrounding the circulation estimates for any particular class. The estimates are more accurate the larger the number of volumes in a class; but even for a large class, such as Fiction published before 1966, the standard deviation of the mean is about one-sixth of the mean; for a smaller class, such as Mysteries published before 1966, the standard deviation of the mean is almost three-eighths of the mean.[7] This means that a considerably larger sample would be needed to obtain a more accurate measure of circulation in any particular class. (To be precise, 95 percent of the time the true mean for Fiction will fall within our estimated mean plus or minus one-third and for Mysteries, plus or minus three-fourths. The standard deviation will decrease as the square root of the number of volumes in a class.)

Actual circulation of the sample does not predict total circulation very well. There were 1339 volumes in the sample, which circulated an average of 1.90 times during the 46 weeks, or 2.15 times at an annual rate. Applying this rate to the collection gives an annual circulation of 258,000, which is approximately 80 percent

[7] These standard deviations were computed by assuming that the circulation of books in a class was uncorrelated. However, there is likely to be positive correlation among book circulation within a class; if one book in a class is frequently out, borrowers may turn to other books in the class. In that case, the standard deviation of the mean is understated.

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of actual circulation. Although the downward bias could be due to random sampling error, it is more likely due to the failure to include all books that were circulating at the time the sample was drawn. Since these books would be more popular than average, excluding them would lead to a downward bias. One other possible source of bias is aging in the collection over the course of the year; books bought after June of 1970 are not included, yet they could be expected to have higher than average circulation.

Fortunately, our major interest in the book selection model is in *relative* circulation across classes. Since the downward bias would be more severe the more popular the class, it should not change our ranking of classes.

MEASURING DEMAND FOR LIBRARY BOOKS: POISSON DISTRIBUTION

Using actual circulation statistics to measure demand creates two problems. The first is that observed circulation does not record in-library usage. We return to this below. The second is that the circulation we have observed contains a random component. For example, if we observe circulation next year, it will not equal circulation this year. Circulation of any book in a certain period can be thought of as a random drawing from a statistical distribution. For example, the distribution may be like that shown in Fig. 3.1. (Of course, there cannot be half a circulation, but we have smoothed the curve.) Suppose we knew what the underlying statistical distribution looked like, and it remained the same over time (though circulation wouldn't necessarily remain the same, since each year would represent a new drawing from the distribution). Then we could better predict circulation over the lifetime

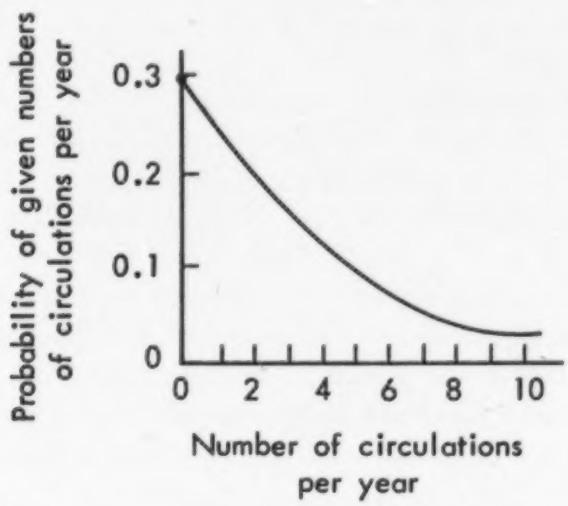

Fig. 3.1—Example of a distribution function probability of a given number of circulations for a given book

of the book, because average circulation would become closer and closer to the average (or mean) of the distribution. Of course, the distribution won't remain the same forever, but we can take account of that. In the following few pages, we consider how such a distribution might be measured. Since use of this distribution did not yield satisfactory results for the book-selection model in practice, the reader may wish to skim the remainder of this section. We will, however, use these results in Chapter VII to analyze the effects of alternative loan periods on circulation.

Demand for library books has been claimed to be approximately Poisson distributed. This distribution could arise if there were a number of individuals who were planning to borrow a library book, and the times at which they came to borrow it were independent of each other. Then, in any particular time period, many or few may come for the book. This distribution has proved useful in many applications. One is the probability of any given number of automobiles arriving at a turnpike toll booth in a 1-minute period, from which one can determine the need for additional toll booths. Mathematically, the distribution can be described as follows: In any particular time period (say 2 weeks), the probability that any given number of individuals will come to the library and request a particular title is

$$P(s) = \frac{e^{-r} r^{s}}{s!}, \tag{3.1}$$

where P(s) is the probability that s individuals come to request a copy of the book, and r is the mean and variance of the distribution. This assumption has been shown to be true in two studies at university libraries (Morse 1968; Buckland and Woodburn 1969).[8]

If the demand for a particular title is Poisson distributed, we can estimate the mean and variance of the distribution for that title using a method developed by Buckland and Woodburn (1969). One advantage of their method is that it takes explicit account of multiple-copy books.[9] Buckland and Woodburn divide time into loan periods, which represent the length of time that the book is allowed to circulate. For example, if books circulate for 2 weeks, this is the loan period. Suppose all books are checked out at the beginning of each loan period and are kept exactly the length of the loan period. Then we can observe as many circulations of the book in the loan period as there are copies of the book, but not more.[10] The probability that a book will circulate s times is given by Eq. (3.1), as long as demand does not exceed the number of copies. Let the number of copies be n. Then the probability that the book circulates n times in a given loan period is 1 minus the sum of the probabilities that it circulates less than n times.

[8] Jain, *et al.* (1969) have found that demand for books at Purdue University is Poisson distributed above zero, but that the probability that the book will not be demanded at all is greater than would be predicted by a Poisson distribution.

[9] Morse's methodology (1968) for inferring demand from observed circulation applies only to single-copy books.

[10] If demand exceeds the number of copies, unsatisfied demand exists. This will probably spill over into subsequent periods, violating the assumption of independence of demand across periods required for the Poisson distribution. In effect, we must assume that a discouraged user goes away and does not return. The error introduced by so doing may account for the apparent downward bias in the number of requests for the book estimated by the Poisson.

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Suppose we observe circulation in a number of loan periods. For example, if there were three copies of the book and we observed circulation for 26 2-week periods, the distribution of circulations by loan period might be as in Table 3.4.

Table 3.4

SAMPLE DISTRIBUTION OF CIRCULATIONS

Circulations per Loan Period	Number of Loan Periods with a Given Number of Circulations
0	20
1	3
2	2
3 or more	1

That is, the book did not circulate at all in 20 of the 26 loan periods; one copy circulated in 3 periods; two copies, in 2 periods; and all copies, in 1 period. We then ask: In the (truncated) Poisson formula, what is the value of r that would have made this observed distribution of circulations the most likely? In technical terms, we derive a maximum likelihood of r, which is the value of r for which

$$(3.2) \qquad L = \sum_{s=0}^{n-1} f_s \log\left(\frac{e^{-r}r^s}{s!}\right) + (f_n) \log\left[1 - \sum_{s=0}^{n-1}\left(\frac{e^{-r}r^s}{s!}\right)\right] \quad \text{is a maximum,}$$

where s is the number of circulations per period and f_s is the number of loan periods with s circulations. Of what use is this? Simply that since r is the mean of the Poisson distribution, it is the expected demand per time period for that book. Over a sufficiently long period, as long as demand remains Poisson distributed with mean r, the total number of requests for the book will become arbitrarily close to r times the number of loan periods considered. The parameter r, however, is not quite the measure of demand we are seeking, for it measures total requests to borrow a title, not just observed circulation. We have, therefore, used the Poisson distribution to calculate the expected number of satisfied requests per period. This we did by computing

$$(3.3) \qquad S = \sum_{i=1}^{N} i \cdot p(i),$$

where N is the number of copies of the book and p(i) is the probability of i requests from a Poisson distribution with mean r.

From the circulation data that were collected, we have computed, for each book, estimates of r, the mean of the Poisson distribution. In the Buckland and Woodburn study, there were very high fines for overdue books, and so the assumption that books were checked out at the beginning of the loan period and were returned at the end of it seemed justified. In our sample, that assumption is clearly not justified; different classes of books are kept different lengths of time. In Table 3.5 we show the

distribution of checkout times by class; an F-test applied to these values indicates that the hypothesis that the classes have the same checkout time can be rejected at the 1 percent level (F with 60 and 2500 degrees of freedom = 2.23). In the interests of computational simplicity, the complication of varying loan periods was ignored; a loan period was defined as 2 weeks, and if a book was checked out during a loan period, it was counted as one circulation during that period. If it was checked out, returned, and checked out again in that period, it was counted as two circulations. To the extent that books are kept more than or less than 2 weeks, our estimates of demand will be biased downward.[11] Table 3.5 shows that average checkout time is approximately 13 days and that the differences in checkout times across classes, although significantly different from zero, are not generally very large, so that ignoring them should not be a bad approximation.

Using 2-week loan periods, we have computed the maximum likelihood estimate of r for each book in the sample. We have then found S, or the satisfied demand rate for each book, grouped the books by class, and averaged the S's for all the books in the class. These numbers, also shown in Tables 3.5 and 3.6 as "Satisfied Demand Rates," are an alternative measure of demand.

The satisfied demand rates in Tables 3.5 and 3.6 are the estimated mean number of satisfied requests per 2-week period for a title in each class. For example, Reference books that circulate average about 0.02 satisfied requests per 2 weeks, or about one every 2 years. By this measure also, the books that circulate most frequently are Mysteries, Fiction, and Psychology. The column labeled "Satisfied Demand Rate" of Table 3.5 shows that the estimated demand rate for the collection is 0.0592 satisfied requests per title per 2-week period, which is considerably below the actual circulation per title per period. If, in fact, demand is Poisson distributed, it was unusually high this past year.

Since the Poisson assumption underpredicts circulation, one can ask whether the assumption that demand for a title is Poisson distributed is reasonable. There is some reason to think it is not.[12] Because of this, and because the downward bias of the estimated satisfied request rate seems even larger than the bias in the sample circulation rate, we have used only sample circulation rates in computing benefits and have not used the estimated satisfied request rate.

Table 3.6 presents demand rates for the more aggregated classes. In general, there is very little change from the more disaggregated classes.

[11] Because (1) if the book is kept less than 2 weeks, and if the number of circulations in a 2-week period exceed the number of copies, the excess was ignored, and (2) if the book is kept more than 2 weeks, unsatisfied demand may be present, which we will not detect.

[12] The most questionable assumptions underlying the Poisson are: (1) the assumption that the demand for a book is Poisson distributed; (2) the assumption of uniform 2-week loan periods; (3) the assumption of independence of demand across periods. If the model underpredicts the probability of no circulation, as Jain found, the first assumption would cause bias in the other direction. The second assumption could cause some downward bias, as discussed above, but the bias is unlikely to be large. The third assumption of independence of demand across periods is unlikely to hold, since users who do not find the book will continue to search for it. This means that the rate of satisfied demand is likely to be higher than we predict, since, in effect, the book will circulate more frequently than if demanders become discouraged. The total estimated demand rate (satisfied plus unsatisfied) is 0.0878, which is very close to the actual circulation rate, implying that all requests are eventually satisfied.

Table 3.5

ACTUAL CIRCULATION RATES AND SATISFIED DEMAND RATES: MINIMUM THREE TITLES PER CLASS

Class	No. of Circulations	Circulation per Volume[a]	Satisfied Demand Rate	No. of Titles	No. of Volumes	Average Checkout Time (as a fraction of 14 days)
All Books	2542	.0826 (.0913)	.0592	1208	1339	.9245
Published before 1966	1580	.0630 (.0704)	.0480	975	1086	
Published 1966 or after	962	.1652 (.1796)	.1061	233	253	
Reference, circulating	5	.0217	.0187	10	10	.87
Philosophy	15	.0725	.0604	9	9	1.10
Psychology						
Published before 1966	23	.1429	.1051	7	7	.99[b]
Published 1966 or after	30	.3261	.2061	4	4	
Religion, except Judaism						
Published before 1966	24	.0949	.0855	10	11	1.64
Published 1966 or after	11	.0531	.0570	8	9	1.06
Judaism	1	.0145	.0126	3	3	.57
Sociology, Economics, Political Science						
Published before 1966	45	.0292	.0248	66	67	.96
Published 1966 or after	46	.0800	.0697	23	25	1.04
Education						
Published before 1966	5	.0435	.0358	5	5	1.10
Published 1966 or after	19	.1377	.1136	5	6	.84
Linguistics						
Published before 1966	16	.1739	.1363	4	4	.88
Published 1966 or after	1	.0109	.0126	3	4	1.29
Mathematics and Statistics	14	.1522	.1216	4	4	.98
Physical Sciences	16	.0632	.0628	9	11	1.00
Life Sciences						
Published before 1966	32	.0732	.0490	18	19	.97
Published 1966 or after	18	.1565	.1226	5	5	.74
Engineering and Technology						
Published before 1966	11	.0399	.0339	12	12	.78
Published 1966 or after	6	.0435	.0445	5	6	1.25
Medicine						
Published before 1966	21	.1141	.0905	8	8	1.04
Published 1966 or after	25	.1812	.1422	6	6	.90
Animal Care and Hobbies	4	.0348	.0299	5	5	.91
Cooking and Other Home Economics	16	.0994	.0797	7	7	.77
Business Skills	33	.1435	.1089	10	10	.85
Art Appreciation						
Published before 1966	32	.0605	.0466	22	23	.87
Published 1966 or after	16	.1739	.1370	4	4	.87
Horticulture and Gardening						
Published before 1966	2	.0290	.0251	3	3	.32
Published 1966 or after	7	.1014	.0821	3	3	.79
Architecture	7	.0380	.0328	8	8	1.09
Art Techniques and Interior Decoration	61	.1473	.0994	16	18	.92
Music	32	.0435	.0424	27	32	.95
Athletics						
Published before 1966	10	.0725	.0608	6	6	.91
Published 1966 or after	16	.2319	.1810	3	3	.76

Table 3.5--*continued*

Class	No. of Circulations	Circulation per Volume[a]	Satisfied Demand Rate	No. of Titles	No. of Volumes	Average Checkout Time (as a fraction of 14 days)
Entertainment	17	.1056	.0125	6	7	.58
Literature and Rhetoric, not elsewhere classified						
Published before 1966	52	.0419	.0388	49	54	.98
Published 1966 or after	9	.0559	.0467	7	7	1.11
Poetry						
Published before 1966	16	.0348	.0304	19	20	1.08
Published 1966 or after	6	.0652	.0550	4	4	.70
Drama						
Published before 1966	48	.0835	.0637	22	25	.91
Published 1966 or after	30	.2609	.1866	5	5	.85
Fiction, classified in the Dewey Decimal System						
Published before 1966	7	.0609	.0516	5	5	.56
Published 1966 or after	11	.1196	.0964	4	4	1.45
Public Speaking	1	.0087	.0075	5	5	1.00
Geography and Travel						
Published before 1966	8	.0386	.0327	9	9	.74
Published 1966 or after	28	.1522	.1174	8	8	.81
Biography						
Published before 1966	79	.0362	.0354	80	95	1.04
Published 1966 or after	19	.0829	.0675	10	10	.75
History						
Published before 1966	81	.0323	.0278	106	109	.90
Published 1966 or after	36	.0870	.0671	18	18	.68
General Fiction and Short Stories, not elsewhere classified						
Published before 1966	218	.0578	.0477	134	164	.87
Published 1966 or after	297	.3003	.1172	38	43	.77
Juvenile Fiction						
Published before 1966	120	.0767	.0548	52	68	.90
Published 1966 or after	33	.1025	.0690	12	14	.99
Juvenile Nonfiction						
Published before 1966	167	.0468	.0438	137	155	1.02
Published 1966 or after	69	.0857	.0744	32	35	1.25
Juvenile Teenage Fiction						
Published before 1966	30	.1630	.1184	8	8	.85
Published 1966 or after	17	.1056	.0880	7	7	.91
Preschool Fiction	125	.2264	.1155	19	24	.98
Preschool Nonfiction						
Published before 1966	8	.1155	.0958	3	3	.04
Published 1966 or after	33	.1435	.1478	8	10	1.08
Young Adult Fiction	40	.2174	.1249	8	8	.82
Young Adult Nonfiction						
Published before 1966	36	.0870	.0710	18	18	.88
Published 1966 or after	24	.2609	.1713	4	4	.80
Westerns	5	.0543	.0448	4	4	.86
Mysteries						
Published before 1966	61	.2210	.1480	12	12	.83
Published 1966 or after	185	.7312	.2419	11	11	.74
Recordings	6	.0290	.0373	6	9	.94

[a]Numbers in parentheses refer to circulation per title.

[b]Combined.

Table 3.6

ACTUAL CIRCULATION RATES AND SATISFIED DEMAND RATES: MINIMUM TEN TITLES PER CLASS

Class	No. of Circulations	Circulation per Volume	Satisfied Demand Rate	No. of Titles	No. of Volumes
Reference, circulating	5	.0217	.0187	10	10
Philosophy and Religion	51	.0693	.0631	30	32
Psychology	53	.2095	.1418	11	11
Sociology, Economics, Political Science					
Published before 1966	45	.0292	.0248	66	67
Published 1966 or after	46	.0800	.0697	23	25
Education	24	.0949	.0747	10	11
Mathematics and Physical Sciences	30	.0869	.0781	13	15
Life Sciences	50	.0913	.0643	23	24
Engineering and Technology	17	.0410	.0374	17	18
Medicine	46	.1428	.1127	14	14
Recreation	73	.0814	.0539	38	39
Business Skills	33	.1435	.1089	10	10
Art Appreciation	48	.0773	.0605	26	27
Art Techniques, Interior Decoration, Architecture	68	.1137	.0772	24	26
Music and Recordings	38	.0403	.0415	33	41
Literature and Rhetoric, not elsewhere classified, and Linguistics	78	.0492	.0446	63	69
Poetry	22	.0399	.0347	23	24
Drama	78	.1131	.0865	27	30
Geography and Travel	36	.0921	.0726	17	17
Biography					
Published before 1966	79	.0362	.0354	80	95
Published 1966 or after	19	.0829	.0675	10	10
History					
Published before 1966	81	.0323	.0278	106	109
Published 1966 or after	36	.0870	.0671	18	18
Adult Fiction					
Published before 1966	225	.0579	.0478	139	169
Published 1966 or after	308	.2864	.1152	42	47
Juvenile Fiction					
Published before 1966	120	.0767	.0548	52	68
Published 1966 or after	33	.1025	.0690	12	14
Juvenile Nonfiction					
Published before 1966	167	.0468	.0438	137	155
Published 1966 or after	69	.0857	.0744	32	35
Juvenile Teenage and Young Adult Fiction	87	.1645	.1114	23	23
Preschool Fiction	125	.2264	.1154	19	24
Preschool Nonfiction	41	.1371	.1470	11	13
Young Adult Nonfiction	60	.1186	.0892	22	22
Mysteries					
Published before 1966	61	.2210	.1480	12	12
Published 1966 or after	185	.7312	.2419	11	11

MEASURING DEMAND FOR LIBRARY BOOKS: IN-LIBRARY USE

We have yet to deal with the problem of books that are used in the library but not checked out. We had requested that if library personnel found a book that was tagged (and therefore in the sample) lying on a table, they were to note it. Given the relatively few tagged books that were found, it became apparent that the in-library users were reshelving many of the books they used. Although we counted each occasion of finding a book on a table as one "circulation" for the purpose of computing circulation rates, it was unlikely that this would account for all the in-library use. Therefore, in our user survey we asked the patrons of the library to list the books they used in the library but did not check out. Table 3.7 shows the distribution by class of books used in the library but not checked out, the distribution of circulation in the sample of books by class, and the distribution of books checked out by class as determined by the user survey. Details of how the user survey was conducted are given in Appendix A.

Since it is difficult to judge by looking at the figures in Table 3.7 exactly how close the agreement among columns is, we have computed the (unweighted) correlation coefficients among the three classes, excluding noncirculating Reference and Science Fiction. The correlation coefficients are: 0.06 between books checked out in the user survey and circulation rates; 0.05 between books used in the library and circulation rates; and 0.75 between books checked out in the user survey and books used in the library. In other words, there is a disturbing lack of correspondence between circulation rates over the year and the circulation reported in the user survey in March; however, the correlation between books checked out in the user survey and those used in the library is quite high. Part of the discrepancy between the numbers of books checked out in the user survey and those checked out in our sample may be caused by individuals in the user survey who checked out several books but did not take the time to list them all. (In particular, this could apply to Mysteries, whose circulation is greatly underpredicted in the user survey.) However, since there is a significant (at 1 percent) association between the books the users checked out and those they used in the library, the approximation will not be bad if we assume that in-library usage by class is perfectly correlated with books checked out by class, and ignore in-library usage. To take account of such usage would not change the relative ranking very much. To ignore it, however, does reduce the absolute amount of the benefits.

The user survey shows that in-library usage is quite significant; the last line of Table 3.7 shows that 527 books were checked out but that an additional 261 (about half as many) were used in the library. However, this ratio is biased, if, as we suspect, those who checked out several books did not take the trouble to list them.[13] Also, 22.3 percent of books used in the library were noncirculating Reference books. Hence, total usage of Reference books is quite significant; this should be kept in mind when appraising the low demand rates for *circulating* Reference books.

[13] Of course, there could have been individuals who used several books in the library and did not report them.

Table 3.7

DISTRIBUTION OF BOOKS CHECKED OUT AND BOOKS USED IN LIBRARY DURING MARCH SURVEY, USING CLASSES DEFINED IN TABLE 3.2

Class[a]	Percentage of Books Used in Library in March	Percentage of Annual Circulation (circulation rate normalized to sum to 100)	Percentage of Books Checked Out in March
Reference, circulating	1.9	.29	0
Philosophy	2.7	.97	2.3
Psychology			
Published before 1966	0	1.91	0
Published 1966 or after	0	4.35	0
Religion, except Judaism			
Published before 1966	0.4	1.27	0.2
Published 1966 or after	1.9	.71	2.3
Judaism	0.4	.19	0.2
Sociology, Economics, Political Science			
Published before 1966	1.1	.39	3.6
Published 1966 or after	5.4	1.07	7.8
Education			
Published before 1966	0	.58	0.8
Published 1966 or after	0.8	1.84	0.9
Linguistics	1.1	2.47	0.6
Mathematics and Statistics	0.4	2.03	0
Physical Sciences	0	.84	0.6
Life Sciences			
Published before 1966	1.1	.98	0.6
Published 1966 or after	2.7	2.09	2.1
Engineering and Technology			
Published before 1966	0	.53	0.4
Published 1966 or after	3.1	.58	1.9
Medicine	0.8	3.92	1.7
Animal Care and Hobbies	1.5	.46	2.1
Cooking and Other Home Economics	0	1.33	1.2
Business Skills	5.4	1.92	2.3
Art Appreciation			
Published before 1966	0	.81	0
Published 1966 or after	0	2.32	0
Horticulture and Gardening	0	1.74	0.4
Architecture	0	.51	0
Art Techniques and Interior Decoration	0	1.97	1.9
Music	1.9	.58	1.1
Athletics			
Published before 1966	0	.97	0.4
Published 1966 or after	0.8	3.10	0.6
Entertainment	2.3	1.41	1.9
Literature and Rhetoric, not elsewhere classified			
Published before 1966	0	.56	0
Published 1966 or after	0	.75	0
Poetry			
Published before 1966	0.4	.46	0.4
Published 1966 or after	0.8	.87	0.8
Drama			
Published before 1966	0.4	1.11	1.1
Published 1966 or after	1.5	3.48	2.1

Table 3.7--*continued*

Class[a]	Percentage of Books Used in Library in March	Percentage of Annual Circulation (circulation rate normalized to sum to 100)	Percentage of Books Checked Out in March
Fiction, classified in the Dewey Decimal System			
Published before 1966	0	.81	0
Published 1966 or after	0.8	1.60	1.3
Public Speaking	0	.12	0
Geography and Travel			
Published before 1966	1.5	.52	0.8
Published 1966 or after	1.9	2.03	0.6
Biography			
Published before 1966	0.8	.48	0.4
Published 1966 or after	4.6	1.10	1.7
History			
Published before 1966	2.3	.43	2.3
Published 1966 or after	5.4	1.16	5.9
General Fiction and Short Stories, not elsewhere classified			
Published before 1966	1.1	.77	7.8
Published 1966 or after	8.0	4.01	11.8
Juvenile Fiction			
Published before 1966	3.8	1.02	2.7
Published 1966 or after	3.1	1.37	8.2
Juvenile Nonfiction			
Published before 1966	0.4	.63	1.3
Published 1966 or after	2.3	1.14	4.9
Juvenile Teenage Fiction			
Published before 1966	0.4	2.18	0.2
Published 1966 or after	0.8	1.41	0.6
Preschool Fiction	0	3.02	1.0
Preschool Nonfiction			
Published before 1966	0	1.55	0
Published 1966 or after	0	1.92	0.4
Young Adult Fiction	0	6.38	0.4
Young Adult Nonfiction	0	1.16	1.3
Westerns	0	.73	0
Mysteries			
Published before 1966	0.4	2.95	1.5
Published 1966 or after	1.5	9.76	1.3
Recordings	(b)	.39	(b)
Science Fiction			
Published before 1966	0	--	0.9
Published 1966 or after	0	--	0.9
Reference, noncirculating			
Published before 1966	10.0	--	0
Published 1966 or after	12.3	--	0
Total Number of Books	261	--	527

[a]The classes in this table are the same as in Table 3.2 with the addition of Science Fiction and Reference, noncirculating. Additional disaggregation of books used in the March survey is given in Table A.2 in Appendix A.

[b]Not asked for.

ESTABLISHING PRICE

Derivation of the appropriate price variable presents some conceptual problems. When a book is first published, there is a minor problem because the library can often buy the book at a discount. However, we have assumed that the price to the library would be the same as that to the public, thereby biasing downward, to some extent, the absolute amount of benefits, but only changing the relative rankings to the extent that discounts differ among classes.

Greater difficulties occur when a paperback edition is issued or when a book goes out of print. The issuance of a paperback edition means that the reader can obtain the book at a cheaper price. But does this reduce the benefit provided by borrowing the book? Presumably not for those who continue to borrow. However, if the paperback price is sufficiently low, some readers who otherwise would have borrowed the book will buy the paperback, and circulation will fall. In this case, readers who do borrow the book will be those who evaluate the benefit from borrowing at a relatively low rate, and the average benefit will fall. Unfortunately, we do not know the extent to which this happens, so we cannot adjust the ratio of benefits received by the borrower to those received by the owner. For this reason we have ignored the problem caused by paperbacks, which means that our measure of price probably overstates the benefits provided by those classes of books including relatively large proportions of paperbacks. If, however, the ratio of benefits received by the borrower to those received by the owner is as low as we believe, relatively few readers will buy the paperback edition instead of borrowing the book, so that very little bias is introduced. (Since the model accounts for a fall in circulation, it is only the possible change in the distribution of willingness to pay that we do not measure.)

A book that is out of print also presents a problem in measuring willingness to pay because the borrower does not have the option of purchasing the book on the market. Hence, he could be willing to pay much more than the former market price for the privilege of borrowing the book. If the library does not own an out-of-print book, the potential reader's alternatives are interlibrary loan, rental libraries, other libraries, or, conceivably, advertising for a copy of the book. We have arbitrarily assumed that the cost of the cheapest of these alternatives is the correction factor b times the original price of the book. Since the proportion of circulation attributable to out-of-print books is unknown, the error introduced by this approximation is not known, but should not be too large. Table 3.8 shows the average price per volume by class.

DERIVATION OF THE PROPORTION OF BORROWERS WHO WOULD HAVE BOUGHT THE BOOK IF THE LIBRARY DID NOT OWN IT

One of the measures of intensity of preference that our model utilizes is the proportion of borrowers who would have bought the book if the library did not own it, the a_{it}'s. To derive the a_{it}, we asked, during our user survey, whether library users

Table 3.8

AVERAGE PRICE PER VOLUME PER CLASS

Class[a]	Average Price		
	Books Published Before 1966	Books Published After 1966	Combined
All Volumes	$ 4.10	$ 5.86	$ 4.41
General Reference, circulating			5.65
Philosophy			3.42
Psychology	4.34	6.30	
Religion, except Judaism	3.68	6.34	
Judaism			3.30
Sociology, Economics, Political Science	4.34	6.21	
Education	3.37	5.64	
Linguistics	4.18	10.82	
Mathematics and Statistics			5.45
Physical Sciences			4.67
Life Sciences	5.51	8.52	
Engineering and Technology	6.54	3.40	
Medicine	3.10	6.67	
Care and Training of Animals			2.24
Food and Cooking			4.50
Home Economics, except Food and Cooking			4.13
Business Skills			4.90
History of Art (Art Appreciation)	14.27	13.36	
Horticulture and Gardening	3.41	11.97	
Architecture			10.86
The Arts (Art Techniques)			6.34
Interior Decoration			9.08
Music			3.82
Hobbies and Indoor Recreation			3.21
Athletics and Outdoor Recreation	7.17	6.47	
Entertainment	5.08	12.13	
Literature and Rhetoric, not elsewhere classified	3.40	7.55	
Poetry	2.36	6.00	
Drama	3.95	3.56	
Fiction, classified in the Dewey Decimal System	3.29	5.19	
Public Speaking			2.79
Geography and Travel	6.53	6.82	
Biography	4.93	7.57	
History	4.89	8.79	
General Fiction and Short Stories, not elsewhere classified	3.30	5.64	
Juvenile Fiction	2.88	3.59	
Juvenile Nonfiction	3.17	3.96	
Juvenile Teenage Fiction	3.26	4.05	
Preschool Fiction	2.85	3.56	
Preschool Nonfiction	3.19	3.11	
Young Adult Nonfiction	4.44	5.22	
Young Adult Fiction			3.25
Westerns			3.05
Mysteries	3.11	4.47	
Science Fiction			4.65
Recordings			5.65
French Language Books			2.00
Foreign Language Books, other than French			2.60

[a]Classes are those given in Table 3.1, excluding Occultism.

would have bought the books they used if the library did not own them. They answered "yes," "no," or "maybe." We have made two calculations, one counting the "yes" answers as 1, the "maybe's" as 0.75, and the "no's" as 0.5, the other ignoring the "maybe's" and counting the "yes" answers as 1 and the "no's" as 0.5. The correlation coefficient between these two series is 0.90. Thus, it makes little difference which we use; henceforth, we will use the series that values "maybe's" as 0.75. Although we have used the resulting numbers to compute the final benefit/cost ratios, in Table 3.9 we have rescaled the numbers to lie between zero and one, so that they are true proportions.[14]

THE CORRECTION FACTOR TO OBTAIN THE VALUE OF LIBRARY SERVICES

Although in Chapter II we made the assumption that the borrower of a book gets some fraction, b_i, of the benefits of ownership and then showed that the b_i are likely to vary across classes, we have found such variation impossible to measure. Hence, we now assume that the benefit obtained by a borrower of a book relative to the benefit derived by a purchaser is independent of the type of book and set all b_i equal. The only marked inequality likely to occur in b_i will be for Reference books, a good many of which were excluded from our sample because they do not circulate. For the classes in our sample, the assumption of equal b_i seems reasonable.[15]

To give some notion of the actual magnitude of the b_i's, data on charges of rental libraries can be used. Their prices would show what the marginal consumer (the consumer who is indifferent about renting or not renting) is willing to pay for the loan of the book. With rental-library data on price and circulation, a demand curve could be constructed and used to test the assumption that b is a constant, independent of p, and does not vary across classes of books. Two price schedules were discovered. A rental library in New York State has the following charge schedule: For books costing less than $7, the charge is 10 cents per day with a minimum of 30 cents; for books costing between $7 and $9, the charge is 50 cents for the first 3 days and 10 cents per day thereafter; for books costing more than $9, the charge for the first 3 days is $1 and 10 cents per day thereafter. The average rental charge is about 70 cents (Anderson 1968). No information is provided on the distribution of books among classes, but if the average book costs around $7, b would be about 0.1 for the marginal consumer. Hunter's Rental Library in Beverly Hills charges 10 cents per day for books "not in demand" and 15 cents per day for books "in demand." No data are available on the average charge. The library tends not to buy "high-priced" books, since they do not pay for themselves given this price structure. These data seem comparable with those from New York.

[14] The a's are appropriately scaled in units of titles, not volumes, since the borrower was, in effect, asked if he would buy the book if the library did not own the title. This complication was ignored.

[15] Robert Slighton has suggested that the percentage missing in each class might be proportional to the b_i. With more reliable measures of this percentage, the suggestion seems worth pursuing.

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Table 3.9

PROPORTION OF BORROWERS WHO WOULD BUY THE BOOK IF THE LIBRARY DID NOT OWN IT

Class	Counting "Maybes"	Ignoring "Maybes"
Reference, circulating	.08	.06
Philosophy	.14	.06
Psychology		
Published before 1966	.18	.10
Published 1966 or after	.10	0
Religion, except Judaism		
Published before 1966	.20	.14
Published 1966 or after	.20	.14
Judaism	.20	.14
Sociology, Economics, Political Science		
Published before 1966	.18	.10
Published 1966 or after	.10	0
Education		
Published before 1966	.18	.16
Published 1966 or after	.18	.16
Linguistics		
Published before 1966	.16	.12
Published 1966 or after	.16	.12
Mathematics and Statistics	.18	.16
Physical Sciences	.18	.16
Life Sciences		
Published before 1966	.18	.16
Published 1966 or after	.18	.16
Engineering and Technology		
Published before 1966	.40	.36
Published 1966 or after	.40	.36
Medicine	.26	0
Animal Care and Hobbies	.20	.08
Cooking and Home Economics	.22	.16
Business Skills	.22	.06
Art Appreciation		
Published before 1966	.12	.08
Published 1966 or after	.04	.04
Horticulture and Gardening		
Published before 1966	.22	.16
Published 1966 or after	.22	.16
Architecture	.08	.06
Art Techniques and Interior Decoration	.30	.16
Music	.60	.54
Athletics		
Published before 1966	.36	.34
Published 1966 or after	.36	.34
Entertainment	.08	0
Literature and Rhetoric, not elsewhere classified		
Published before 1966	.10	0
Published 1966 or after	.10	0

[*continued*]

Table 3.9--*continued*

Class	Counting "Maybes"	Ignoring "Maybes"
Poetry		
Published before 1966	.22	.20
Published 1966 or after	.22	.20
Drama		
Published before 1966	.20	.12
Published 1966 or after	.20	.12
Fiction, classified in the Dewey Decimal System		
Published before 1966	.10	0
Published 1966 or after	.10	0
Public Speaking	.20	.08
Geography and Travel		
Published before 1966	.18	.14
Published 1966 or after	.18	.14
Biography		
Published before 1966	.18	.06
Published 1966 or after	.18	.06
History		
Published before 1966	.16	.06
Published 1966 or after	.14	.06
General Fiction and Short Stories, not elsewhere classified		
Published before 1966	.28	.22
Published 1966 or after	.26	.20
Juvenile Fiction		
Published before 1966	.30	.18
Published 1966 or after	.38	.30
Juvenile Nonfiction		
Published before 1966	.06	0
Published 1966 or after	.32	.20
Juvenile Teenage Fiction		
Published before 1966	.12	.14
Published 1966 or after	.12	.14
Preschool Fiction	.36	.26
Preschool Nonfiction		
Published before 1966	.30	.18
Published 1966 or after	.38	.30
Young Adult Fiction	.12	.14
Young Adult Nonfiction		
Published before 1966	.16	.16
Published 1966 or after	.16	.16
Westerns	.10	.06
Mysteries		
Published before 1966	.10	.06
Published 1966 or after	.10	.06
Science Fiction	.46	.40
Recordings	.20	.12

NOTES ON THE CONSTRUCTION OF TABLE 3.9

When responses in classes were fewer than seven, classes were combined and pooled estimates were used. The most frequent combination of classes was to combine those for before and after 1966 for the same class. This was felt to be justified because those two classes were more likely to be similar with respect to willingness to buy and also because the mean across all classes for books published before 1966 was .20 and the mean for all books published in 1966 and after was .22 (counting "maybe's" as .50; ignoring "maybe's" gives figures of .12 and .14, respectively). Obviously this difference is statistically insignificant; hence, pooling across time seems reasonable. In cases where a_{i1} equals a_{i2} (that is, where the a before 1966 equals the a after 1966), the data have been pooled. There also had to be some pooling across classes. There were no responses in the class of Psychology, and so the responses for Sociology, Economics, and Political Science were used as an estimate. Mathematics and Statistics, the Physical Sciences, and the Life Sciences were pooled. There were no responses at all for Art Appreciation or for Architecture. The a's for these classes were estimated from the a's for Reference works. Cooking and Home Economics was pooled with Horticulture and Gardening. No books in Literature and Rhetoric, not elsewhere classified, were consulted; the a's for this class were estimated to be the same as for Fiction, classified in the Dewey Decimal System. There was only one book consulted in Public Speaking; it was pooled with Hobbies and Animal Care to obtain a common estimate. No Westerns were consulted in the user survey; the estimate for Mysteries was used instead. Young Adult Fiction and Juvenile Teenage Fiction were combined. Preschool Fiction was included with Juvenile Fiction and Preschool Nonfiction was included with Juvenile Nonfiction. Although no books in Science Fiction were included in the sample whose circulation was followed, the a's calculated from the Science Fiction books are included here; they were well above the mean. Judaism was pooled with Religion.

On the basis of this very sketchy evidence, we will assume b to be 0.1. This choice seems conservative; if b is much less than 0.1, it will not be worthwhile to take the time and trouble to go to the library at all. It bears repeating, however, that unless b varies across classes, the relative ranking of classes is invariant to the size of b.

THE DISCOUNT RATE

To compare future benefits with present ones, a discount rate is needed. We have chosen to work with a 4 percent rate and a 10 percent rate. These rates are chosen as examples of those that are felt to be moderately low and moderately high.

Choice of the discount rate determines the weight to be given to circulation in later years relative to circulation now. Books such as best sellers that have their greatest circulation in the years shortly after publication are favored if the discount rate is relatively high, and conversely if the discount rate is relatively low. Also, a high discount rate means that all the benefits derived from an asset such as a book are valued less highly than the benefits available from other current expenditures (such as, for example, additional personnel at the charge-out desk).

In our formulation of the problem, there are two time periods, before 1966 and 1966 and after. We can thus obtain weights to be assigned to circulation in both periods from the choice of the discount rate. The weights for early and late periods are 20.4 and 4.6, respectively, using a 4 percent discount rate, and 5.8 and 4.2 using a 10 percent rate.[16] The weights are more sensitive in the lower range; an 8 percent rate would yield weights of 8.2 and 4.3. We have assumed that a book provides benefits forever. While this may seem like an extreme assumption, modifying it to 25 years (or so) would change the numbers very little. This is because circulation far in the future is very heavily discounted. For example, at a 10 percent discount rate, 91 percent of the benefits of a book will have been realized after 25 years, even if the book has an infinite life and continues to circulate at its present rate.

RESULTS OF APPLYING THE MODEL

What we have derived so far is an operational measure of the benefit provided the community by an average volume in each of our classes. Three more facts are needed to implement this model completely: the cost of the benefits provided; how circulation in a class changes as books are added; and what distributional constraints are placed on book purchase (if any) to ensure that some readers' preferences are not completely ignored.

Cost figures are available. For any new book, the acquisition cost is the cost of the book plus the labor costs of selecting, cataloging, and processing it. In Chapter V, this latter set of costs is shown to be $5.55 per book. This figure we assume to be constant as the number of books purchased changes. The benefit/cost ratio of additional books in the ith class is then

$$\frac{B_i}{C_i} = 0.1\left[\frac{a_{i1}p_{i1}q_{i1}r_1}{p_{i1}+5.55} + \frac{a_{i2}p_{i2}q_{i2}r_2}{p_{i2}+5.55}\right], \tag{3.3}$$

[16] These numbers are derived as follows: An asset that yields $1 per year in perpetuity is worth $1/r today, where r is the discount rate. We have, in effect, divided perpetuity into two periods, the first 5 years and the remainder of the asset's life. The portion of the asset's value that is recovered in the first 5 years is

$$\sum_{i=0}^{4} = 1/(1+r)^i.$$

(Actually the sum should be from i = 0.5 to i = 4.5 in unit steps, but for computational ease, we have kept i as an integer.) The portion that is recovered over the remainder of the asset's life is (1/r) minus the sum in the above equation.

where r_1 and r_2 stand for the weights derived from the discount rate.[17]

If we could assume that the circulation of books was a constant fraction of the number of books bought by the library, the acquisition problem would be straightforward. The library would simply buy books in the class that had the highest benefit/cost ratio until it violated a distributional constraint; then it would purchase in the next highest, and so forth. For example, the library would buy only Mysteries until it felt that it was giving enough service to readers of this class of books.

If, however, as is likely, circulation in a class decreases as the number of books in the class increases (because not all books in the class are equally popular and the library buys the most popular books first), the benefit provided by an additional book in a class is less, the greater the number of books bought in that class. In this case, to optimize one would need to know how circulation decreased as the number of books in a particular class was increased. Since we do not know this, we can only indicate which classes the library should begin to strengthen. Those are naturally the ones with the highest benefit/cost ratios. We indicate the benefit/cost ratios for various aggregations of books and various discount rates in Tables 3.10 and 3.11.

The rankings are not very sensitive to either the discount rate or the aggregation scheme used. (Recall that the use of the lower discount rate means that book classes whose circulation does not fall off rapidly are more favored.) Although there may appear to be some discrepancies between the rankings as a result of using the two discount rates, Spearman's rank correlation coefficient between the two rankings is 0.94, which indicates that there is close agreement.

No matter which computation scheme is employed, Mysteries have the highest benefit/cost ratio. Given their circulation rate in Tables 3.5 and 3.6, this is not surprising. Mysteries published after 1966 circulate every 3 weeks, which is much more frequently than books in any other class. After Mysteries, the choice of discount rate plays a role in determining the exact ranking. As expected, Adult Fiction is one of the classes most sensitive to the discount rate. This class ranks much higher when the 10 percent discount rate is used, meaning that the circulation of books in this class decreases more rapidly than that in other highly ranked classes. Aggregating the books into a minimum of ten titles per class has lowered the rankings of some of the classes that were highly ranked in the three-titles-per-class aggregation. For example, Art Techniques has been combined with Architecture and Interior Decoration, Young Adult Fiction has been combined with Juvenile Teenage Fiction, and Mathematics and Statistics has been combined with Physical Sciences.

Another way to assess the results is to note that in the Fiction classes, Mysteries, Preschool Fiction, and Young Adult Fiction have the highest benefit/cost ratios. In the Nonfiction classes, Art Techniques, Psychology, and Business Skills are the highest. The low ranking of the circulating Reference class is not surprising, since most books in this class are used in the library. For that reason it should not be taken as indicative of the benefit/cost ratio of Reference books in general, which would probably be much higher. We have already shown that Reference books account for

[17] Books given to the library, of course, have price (p_i) equal to zero. In our calculations, however, we have valued all books at their market price, thus ignoring gifts.

Table 3.10

CONSERVATIVE BENEFIT/COST RATIOS: MINIMUM OF THREE TITLES PER CLASS

Class	4% Discount Rate	10% Discount Rate	Rank Using 10% Rate
1. Mysteries	4.15	2.53	1
2. Preschool Fiction	3.46	1.38	3
3. Art Techniques	3.40	1.36	5
4. Young Adult Fiction	2.92	1.17	7
5. Mathematics and Statistics	2.89	1.16	8
6. Psychology	2.78	1.51	2
7. Business Skills	2.67	1.07	11
8. Athletics and Outdoor Recreation	2.57	1.37	4
9. Entertainment	2.20	0.88	14
10. Art Appreciation	2.12	1.08	10
11. Young Adult Nonfiction	1.98	1.11	9
12. Juvenile Teenage Fiction	1.94	0.74	17
13. Preschool Nonfiction	1.90	0.81	16
14. Drama	1.88	1.00	12
15. Cooking and Other Home Economics	1.74	0.70	19
16. General fiction and Short Stories, not elsewhere classified	1.72	1.21	6
17. Medicine	1.71	0.96	13
18. Life Sciences	1.57	0.87	15
19. Linguistics	1.42	0.43	27
20. Geography and Travel	1.23	0.72	18
21. Engineering and Technology	1.22	0.43	26
22. Juvenile Fiction	1.17	0.54	21
23. Religion, except Judaism	1.14	0.45	24
24. Physical Sciences	1.11	0.44	25
25. Fiction, classified in the Dewey Decimal System	0.92	0.50	23
26. Music	0.92	0.37	31
27. Education	0.90	0.56	20
28. Architecture	0.88	0.35	32
29. Philosophy	0.81	0.33	34
30. Biography	0.76	0.43	28
31. Juvenile Nonfiction	0.72	0.38	30
32. History	0.70	0.43	29
33. Westerns	0.69	0.28	36
34. Horticulture and Gardening	0.69	0.51	22
35. Sociology, Economics, Political Science	0.62	0.35	33
36. Recordings	0.57	0.23	38
37. Literature and Rhetoric, not elsewhere classified	0.53	0.28	37
38. Poetry	0.48	0.29	35
39. Hobbies and Indoor Recreation	0.46	0.18	39
40. Reference, circulating	0.38	0.15	40
41. Judaism	0.21	0.08	41
42. Public Speaking	0.11	0.05	42

Table 3.11

CONSERVATIVE BENEFIT/COST RATIOS: MINIMUM OF TEN TITLES PER CLASS

Class	4% Discount Rate	10% Discount Rate	Rank Using 10% Rate
1. Mysteries	4.15	2.53	1
2. Preschool Fiction	3.46	1.38	3
3. Psychology	2.78	1.51	2
4. Business Skills	2.67	1.07	7
5. Art Techniques and Architecture	2.62	1.05	8
6. Young Adult and Juvenile Teenage Fiction	2.28	0.89	11
7. Art Appreciation	2.12	1.08	6
8. Young Adult Nonfiction	1.98	1.11	5
9. Preschool Nonfiction	1.90	0.81	13
10. Drama	1.88	1.00	9
11. Medicine	1.71	0.96	10
12. Adult Fiction	1.69	1.18	4
13. Mathematics and Physical Sciences	1.58	0.63	16
14. Life Sciences	1.57	0.87	12
15. Recreation	1.48	0.71	15
16. Geography and Travel	1.23	0.72	14
17. Engineering and Technology	1.22	0.43	19
18. Juvenile Fiction	1.17	0.54	18
19. Philosophy and Religion	0.96	0.38	22
20. Education	0.90	0.56	17
21. Music and Recordings	0.84	0.34	25
22. Biography	0.76	0.43	20
23. Juvenile Nonfiction	0.72	0.38	23
24. History	0.70	0.43	21
25. Literature and Rhetoric, not elsewhere classified, and Linguistics	0.63	0.30	26
26. Sociology, Economics, Political Science	0.62	0.35	24
27. Poetry	0.48	0.29	27
28. Reference, circulating	0.38	0.15	28

more than 20 percent of all in-library use, and that in-library use is a significant fraction of total use. Art Techniques and Art Appreciation both rank relatively high, indicating that the art collection project of the Friends of the Beverly Hills Library is meeting a demand.[18]

The absolute size of the benefit/cost ratios is sensitive to the discount rate employed. A great many individual ratios are over 1. For the entire collection, the benefit/cost ratio is around 1.5, using a 4 percent discount rate and around 0.6, using a 10 percent discount rate. It should be stressed, however, that these are *conservative* estimates for a number of reasons: (1) In-library use has not been valued at all, and it may account for one-quarter to one-third of total use. (2) It is likely that some books that circulate more than average were excluded from the sample, since actual circulation exceeds that predicted by the sample by 25 percent; total benefits would

[18] Although the demand appears to be generated by a very small group. (See Chapter VII.)

then be understated by this amount. (3) The price used to evaluate benefit to the community was the price the library paid for the book; however, for many books the individual purchaser would have to pay a higher price for the book than the library, so that the benefit that the community receives has been understated. (4) The ratio of benefit received by a borrower to that received by an owner was set at 0.1, which we feel is quite conservative; changing this ratio to 0.2 would have the effect of doubling all the benefit/cost ratios. (5) We have treated books that the library receives as gifts as though they were purchased. If books received as gifts circulate less than books that the library purchases, we have understated the circulation and hence the benefit of books to which the library allocates its book budget. The costs of processing donated books are far from negligible, however. (6) Out-of-print books that circulate may, on the average, yield a higher benefit than we have attributed to them. On the other hand, we have calculated the average circulation rate for books that the library has already acquired. If additional books circulate less than those that are acquired first (that is, if circulation does not rise proportionately with book stock), then we have overpredicted circulation for additional books. Moreover, including paperbacks in our calculations would lower the amount of benefit.

Taking all of these factors into account could result in scaling all the benefit /cost ratios upward by, say, 50 percent. However, our chief interest has been in the allocation of a given book budget among classes of books and not in the proper size of the book budget. For allocating a given book budget, it is the relative benefit/cost ratios that matter and not their absolute size. Even if all of the qualifications given above were taken into account, the relative rankings would probably not change very much. Thus, we conclude that the more highly ranked classes are the classes that should be strengthened.

It should be emphasized that the gains from reallocating the book budget, in terms of the benefits that the library can provide to the community, are significant. The most highly ranked classes have benefit/cost ratios that exceed the lowest-ranked classes by factors of roughly 20. Provided circulation in these classes does not fall off rapidly as holdings in them increase, orienting acquisition policies toward the highly ranked classes will pay sizable dividends.

FUTURE IMPLEMENTATION OF THE BOOK-SELECTION MODEL AT THE BEVERLY HILLS LIBRARY

Continuing use of the book-selection model depends on generation of the kinds of data that have been used in this chapter, specifically, information on the circulation rate of each book, its price, the proportion of the community that would buy it if the library did not own it, and the processing costs associated with it. Then, given a discount rate and the assumption of equal b_i (the ratio of benefits of a borrower to those of an owner) across book classes, relative benefit/cost ratios can be cal-

culated for each book and average benefit/cost ratios computed for classes of books.[19] Since information on the proportion of the community that would buy the book is difficult to obtain, we recommend that the library continue to use the data we have collected (shown in Table 3.9) for a number of years, after which it would be appropriate to resurvey users.

Circulation rates can be collected as part of an automated circulation system, as described in Chapter VI. Such information will be difficult to obtain without an automated circulation system and will have to be collected on a sample basis, as was done in this study. With an automated system, our classes could be retained, or a greater number of more narrowly defined classes could be specified. Estimation of circulation rates in more narrowly defined classes would be possible, since information on the circulation of the entire collection would be available.[20]

An automated system could also detect very popular books, so that additional copies could be ordered and the benefits provided by the book collection increased. An appropriate criterion might be to buy an additional copy if the benefit/cost ratio for the additional copy exceeded the average for its class or for the library. This is a modification of the criterion suggested by Morse (1968), who discusses at length the problem of ordering additional copies.

A better adjustment for the time profile of circulation would also be possible with an automated circulation system. Each class of books could be grouped into more narrowly defined time classifications, say, books 2 years old or less, books from 3 to 5 years old, books 5 to 10 years old, and so forth, instead of merely less than and more than 5 years old as we have done. Even more specific time groupings might be possible. In this case the discount rate or weight applied to each time period would have to be calculated; this could be done using the formula shown in footnote 16.[21]

Data on prices of new books could be routinely collected as part of new book processing, thus providing information on the costs of acquiring books in various classes. If the "hybrid" circulation system described in Chapter VI is adopted, a punch card for each book will have to be prepared. The card could include information about the price of the book, so that prices of circulating books could be kept. This would supply the information needed to calculate benefits provided by the various classes in the collection.

Costs of selecting and processing new books will also have to be calculated. If a program budget is prepared each year, such costs will be readily available. To

[19] Improved calculations can be made relative to those in this chapter. Specifically, a benefit/cost ratio can be calculated for each title, and then these ratios averaged to yield the average benefit/cost ratio in a class. Our method was to calculate the average price, the average circulation rate, and so forth, and then compute the product of the averages rather than the average of the product. This procedure is justified if the variables are independent of each other, an assumption that appears to hold in our sample, since the correlation between average price per class and average circulation per class was essentially zero ($r = -0.0064$). Further work, however, can relax this assumption.

[20] One would have to disaggregate the a's and the p's as well; estimates of the values of the a's could be made from the data in Table 3.9. The prices of new books will have to be collected; Table 3.8 can be used to estimate the average price of books already in the collection.

[21] The summation of terms would correspond to the relevant years. For example, i takes on the values 0 to 4 in footnote 16; under the above scheme it would take on the values 0 to 2, 3 to 5, 5 to 10, and so forth, with the last period having a weight equal to 1/r minus the sum of the terms that have come before.

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prepare such a budget, it will be necessary to collect data on the allocation of staff time to various programs. The model used in Chapter V can be followed for this purpose.

Over time the community's tastes in books will change, and acquisition policies will be able to close the current gaps between user demands for classes of books and their representation in the collection. As this happens, the calculations made in this chapter will cease to be valid and new ones will have to be derived. Such calculations will be quite costly without the capability of processing the necessary data on the use and costs of the book collection.

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IV

WHO USES THE LIBRARY AND HOW MUCH DO THEY USE IT?

A STRIKING FACT to emerge from our analysis of the Beverly Hills Public Library is that it is very heavily used relative to other public libraries. To ascertain the community's use of its library, we made a mail survey of registered voters in Beverly Hills late in 1970. Details of how this community survey was conducted are reported in Appendix B.

CARDHOLDING AND USE BY THE COMMUNITY

As Table 4.1 shows, about 50 to 60 percent of the households in Beverly Hills possess one or more library cards, a very high percentage.[1] Comparable figures from other areas are shown in Table 4.2. Most of them are well below 60 percent and most are biased upwards. They were generally gathered by counting the number of library cards and dividing by an estimate of the population. The accuracy of this method depends on weeding out cardholders who have died or moved away. To do so can alter the percentage quite sharply, as was shown in Montclair, New Jersey, when updating the list of cardholders reduced the percentage of the population with a card from 41.7 percent to 30, a drop of 25 percent (Berelson 1949). The 1939 Chicago survey, the only other example of a mail survey, found that only 6 percent of the residents had cards. Note that our measure is a measure of the percentage of

[1] The numbers in Table 4.1 and elsewhere are biased upward by ignoring the estimated 16 percent of the population that is not registered to vote. The bias is not likely to be large, however.

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Table 4.1

LIBRARY CARDHOLDING IN BEVERLY HILLS

	Percentage of Cardholders
Initial respondents (39%) of total sample).....	68.2
Respondents to follow-up[a] (21% of total sample)...	53.6

[a]If nonrespondents are as likely to have cards as those responding to a follow-up, 59% of the households in Beverly Hills have cards. If they are half as likely to hold a card, 49% of the community are cardholders.

Table 4.2

LIBRARY CARDHOLDING IN OTHER AREAS

	Place and Date	Percentage of Cardholders
(1)	California Residents, 1965.....	30
(2)	Indiana Residents, 1967.....	40
(3)	Colton, California, Residents, 1965.....	50
(4)	Ontario, California, Residents, 1965.....	57
(5)	San Bernardino Residents, 1965.....	35
(6)	San Bernardino County Residents, 1965.....	33
(7)	Redlands, California, Residents, 1965.....	58
(8)	Upland, California, Residents, 1965.....	83
(9)	Montclair, New Jersey, Residents, 1947....	30
(10)	All United States Residents, 1947.....	25
(11)	Chicago, Illinois, Residents, 1939[a].....	6
(12)	Hayward, California, Residents, 1955.....	19

Sources: (1), (3)-(8) Hart and Palmer (1966); (2) Pfister and Milliman (1970); (9), (10) Berelson (1949); (11), (12) Carnovsky (1967).

[a]Survey methods similar to ours.

households that possess at least one card, which could differ from the percentage of the population that holds a card.[2]

Although the percentage of cardholders in Beverly Hills is high, a somewhat disturbing fact is that a substantial number of individuals who do not now have a library card once did. Of the households that do not have cards, 32 percent had them at one time. In other words, about 15 percent of the households in the community once had a card, but now do not. One possibility is that such households are composed of aged persons who no longer enjoy reading. However, in only one-third of these households is the head of household over 65 years of age. Hence, while the library appears to serve a large part of the community, it would seem that its potential is still greater.

In Beverly Hills, actual use of the library, as opposed to cardholding, also appears to be high relative to other areas. Visits per year by the person in the household who uses the library the most average between 15 and 20, or about one visit every 3 weeks. (The number of visits by the entire household, of course, may be considerably higher.) No comparable statistics on the number of visits were found, but there are some comparable statistics if we look at the distribution of use. Table 4.3 shows the distribution of visits per year to the Beverly Hills Library by the person in the household who uses the library the most. Only 17 percent of the households who responded said they made no use of the library, and nearly half the households use the library once a month or more. If nonrespondents are all assumed not to use the library, 40 percent of the households do not use the library. This is an extreme assumption, and the true figure lies somewhere between 17 percent and 40 percent. Table 4.4 shows somewhat comparable statistics from other areas. The New York State study attempted to control for educational differences among communities by measuring the percentage of the college graduates in a community whom a public library attracted. In Beverly Hills, 41 percent of those households headed by a college graduate used the library.

VARIATION IN CARDHOLDING AND USE

It is interesting to ask what determines variation in the use of the library among households. That is, can we find common characteristics among households that use the library intensively? If so, we can determine what kinds of households benefit from public provision of library services. In analyzing the distribution of public services, households are traditionally classified by income group; that is, the usual question is, Which income groups benefit from and which pay for various public services? The literature on public libraries has made some effort to answer this question; the usual conclusion is that it is the middle class who benefits; the upper class is thought not to use the library, nor do the poor (Leigh 1950, Ennis

[2] Since all members of the household can use one card, the household seems to be the appropriate unit of observation.

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Table 4.3

DISTRIBUTION OF VISITS TO BEVERLY HILLS LIBRARY BY PERSON IN HOUSEHOLD WHO USES THE LIBRARY THE MOST

Distribution of Visits	Percentage of Respondents	Percentage of Sample If Non-respondents Are All Assumed *Not* To Use Library
No Use	17.0	40.7
Fewer than one visit per year	5.2	3.7
One or two visits per year	9.4	6.7
Three to six visits per year	21.8	15.6
One to three visits per month	29.8	21.3
One visit per week	12.2	8.7
Two visits per week or more	4.6	3.3

Table 4.4

USE OF PUBLIC LIBRARIES IN OTHER AREAS

	Place and Date	Percentage of Library Users and Nonusers
(1)	Indiana, 1967.....	82.7% of the men and 70.2% of the women did not use the library at all
(2)	Cleveland, 1966.....	76.4% of the adults had not used the library within previous 6 weeks
(3)	Chicago, 1968.....	77.7% did not use the library
(4)	New York State, 1965.....	"Best" public libraries attract 15-30% of the college graduates in a community
(5)	United States, 1947.....	82% of the adults had not used the library in the previous year; of the users, 20% used the library once a week or more; 50% used it less than once a month

Sources: (1), (2) Pfister and Milliman (1970); (3) Martin (1969); (4) University of the State of New York (1967); (5) Berelson (1949).

1965).[3] Libraries are generally financed by the property tax, and the incidence of the property tax is similar to this distribution of benefits (Netzer 1966).[4] However, the assertion that high-income and low-income households do not use the library receives very weak support from our evidence; in Beverly Hills, usage is nearly independent of income.

If income isn't associated with library usage, what is? By far the most important factor in explaining variation in cardholding and use across households is the presence or absence of a child living at home. Table 4.5 shows the distribution of cardholding according to whether or not the household includes a child. Over 90 percent of the households with a child living at home have a card, but only 55 percent of two-person households with no child have a card and 40 percent of one-person households. Age also appears to have an effect on use; Table 4.6 shows that if we group households by age of the head of household, there is little difference among households with heads under 65 in terms of use, but households with heads over 65 use the library only half as much.

This latter statistic points up a difficulty with this type of analysis. How do we know if the dropoff in usage among those over 65 is due to age or to the fact that no child is likely to be living at home? To answer that question, a more complicated analysis is needed. What we need is a tool that permits us to hold one variable constant while allowing another to vary. Such a tool is multiple regression analysis. To use it we hypothesize that use and cardholding are functions of a number of variables. For lack of information we make the functions linear:

(4.1) Probability Household Holds a Card = a_1 Presence of Child at Home + a_2 Education of Head of Household + a_3 Use of Library + a_4 Age of Head of Household + a_5 Employment Status of Female in Household + a_6 Distance of Household from Library + Other Possible Variables + an Error Term.

(4.2) Use of Library = β_1 Presence of Child at Home + β_2 Education of Household Members + β_3 Income of Household + Other Possible Variables + an Error Term.

In the above equations, the a's and β's are constants to be estimated. Variables such as the presence of a child take the value 1 if the household includes a child, zero if not. Variables such as the education of the head of the household are in terms of number of years of education. The advantage of assuming the relationship to be of this form is that we can estimate the effect of certain variables, such as the presence of a child, while holding other relevant variables, such as age, constant.

Equations 4.1 and 4.2 assume that cardholding is a function of use, but use is

[3] It should be noted, though, that willingness to pay taxes in support of the library may not be well correlated with use; a number of individuals replying to the questionnaire noted that although they themselves did not use the library, they thought it was an important civic resource and were willing to support it. This seems to be additional evidence that libraries are endowed with what has elsewhere been called a "halo" effect (Leigh 1950).

[4] Morgan, *et al.* (1962), however, indicates that the property tax is regressive.

Table 4.5

DISTRIBUTION OF LIBRARY CARDHOLDING IN BEVERLY HILLS BY COMPOSITION OF HOUSEHOLD

Composition of Household	Number of Households in Sample	Percentage of Households with One or More Adults Holding a Card	Percentage of Households with No Adults Holding a Card but One or More Children Holding a Card	Percentage of Households with No Card	Total Percentage
Children living at home	419	79.0	12.4	8.6	100.0
Two-person households with no child living at home	461	55.1	--	44.9	100.0
One-person households	338	39.6	--	60.4	100.0

Table 4.6

EFFECT OF AGE OF HOUSEHOLD HEAD ON LIBRARY USE

Age of Head of Household	Visits per Year by Person Using the Library Most (respondents only)
Under 25	20.2
25-39	19.9
40-64	21.9
65 or over	10.8

not a function of cardholding. That is, it is assumed that there is no causal relationship between cardholding and use, that the direction of causality runs from desired use to cardholding, and that cardholding merely reflects desired usage. This assumption seems reasonable, and it is important in measuring the effect of use on cardholding.[5] This formulation also implies that if a variable such as the presence of a child affects use of the library, and use affects cardholding, there is an indirect as well as a direct effect of the presence of a child on cardholding.

Let us now examine the effects of the different variables on cardholding and use. These effects are shown in Table 4.7.[6] The first and second equations in Table 4.7 are estimates of Eq. 4.1; the third and fourth, of Eq. 4.2. Cardholding is measured as a variable that takes the value 1 if an adult has a card, 0.5 if only a child has a card, and zero if no one in the household has a card. Use is measured as visits per year by the person who uses the library the most.

Table 4.7 reinforces the conclusions that were reached above on the importance of children living at home to library cardholding and usage. The first equation shows that, all other things equal, the presence of a child raises the likelihood that the household will have at least one card by 22 percentage points. If the head of the household is under 25, all other things equal, the household is 18 percentage points less likely to have a card than if the household is headed by someone between 25 and 64; and if the head is 65 or over, the household is 12 percentage points less likely to have a card. Thus, the absence of a child and the presence of an aged head combine to make cardholding low among the aged, but the absence of a child is the more important factor. Use does affect cardholding; every ten visits raises the likelihood of having a card 3 percentage points.[7] Each year of education (up to a maximum of

[5] If use and cardholding are functions of each other, their separate effects cannot be disentangled unless a variable that affects cardholding but not use, and another variable that affects use but not cardholding, can be specified *a priori*. In technical terms the coefficients would not be identified. Our formulation is recursive.

[6] A discussion of the econometric techniques used to estimate the numbers shown in Table 4.7 can be found in Appendix B.

[7] The problem of bias in the estimation of this coefficient is discussed in Appendix B.

Table 4.7

REGRESSION ANALYSIS OF CARDHOLDING AND USE: 900 OBSERVATIONS

Equation Number	Dependent Variable	Estimation Method	Coefficients of Explanatory Variables[a]: Presence of Child (1 if child lives at home, 0 otherwise)	Use (visits per year by person who uses library most)	Education of Head of Household (in years; maximum is 17)	First Age Variable (1 if head over 65, 0 otherwise)	Second Age Variable (1 if head under 25, 0 otherwise)	Female Labor Force Participation (1 if female employed, 0 otherwise)	Distance from Library (in miles)	Income of Household (in thousands of dollars)	Book Expenditure (in hundreds of dollars)	Constant	R^2 (proportion of variation explained)
(1)	Probability of holding a card	Ordinary least squares	0.22 (0.032)**	0.0030 (0.0006)**	0.030 (0.007)**	-0.12 (0.044)**	-0.18 (0.065)**	0.74 (0.32)*	-0.038 (0.024)	--	--	+0.09	0.18
(2)	Probability of holding a card	Instrumental variables (see Appendix B)	0.24 (0.031)**	0.011 (0.0019)**	0.029 (0.007)**	-0.13 (0.044)**	-0.205 (0.065)**	0.64 (0.32)*	-0.038 (0.024)	--	--	-0.09	0.19
(3)	Number of visits	Ordinary least squares	15 (1.6)**	--	--	--	--	--	--	--	--	-1.1	0.08
(4)	Number of visits	Ordinary least squares	14 (1.7)**	--	0.56 (0.42)	--	--	--	--	-0.041 (0.036)	+0.88 (0.64)	-10.7	0.09
(5)	Probability of holding a card	Not estimated; Eq. (4) substituted into Eq. (1)	+0.26	--	0.032	--	--	+0.074	-0.038	Negligible	Negligible	+0.06	--

[a]Standard errors are given in parentheses. Those with a double asterisk are significant at 1%; those with a single asterisk are significant at 5%.

17) raises the probability of having a card 3 percentage points. Cardholding falls off the farther the household lives from the library, 4 percentage points for each mile. Finally, one surprising result is that households with employed females are 7 percentage points more likely to hold a card than households without an employed female.

The second equation can be ignored. For a discussion of it, see Appendix B.

The third and fourth equations show that, despite the multiplicity of factors affecting cardholding, very little other than the presence of a child makes a difference in households' actual *use* of the library. Households with children make on the average fourteen or fifteen more visits per year to the library than households without children. Variables not entered, such as age, are not significantly associated with use. Moreover, those that are entered do not have a strong effect on use either. A household headed by an individual with 4 more years of education than the head of another household will, other things equal, only average two more visits per year. Those who buy books are slightly more likely to use the library; a household that spends $100 more on books than another, all other things equal, will average about one more visit per year to the library.[8] If book expenditure is held constant, households with higher incomes are only slightly less likely to use the library;[9] a $25,000 difference in income will result in an annual reduction of one library visit. Nevertheless, the effect is in the expected direction.[10] However, the coefficients of education, income, and book expenditures are not significantly different from zero even at a 10 percent level.[11]

The fifth equation in Table 4.7 shows the sum of both the direct and indirect effects of use upon cardholding. These estimates are the result of substituting the equation for use (Eq. (4) in Table 4.7) into the equation for cardholding (Eq. (1) in Table 4.7). The effect of use on cardholding is sufficiently small that the total effect is not very different from the direct effect.

WHO USES THE LIBRARY?

While we have quantified the effect of variables, such as a child's living at home upon the household's use of the library, we have not determined who in the household uses the library. This information was obtained in our user survey. The

[8] The positive association between book purchases and library services does not indicate that they are complementary in a technical sense; some individuals may merely place a higher value on reading.

[9] Regressing the logarithm of book expenditure upon the logarithms of income and education yields elasticity estimates of 0.21 and 0.15, respectively.

[10] This effect is probably best explained by a straightforward price-of-time argument (Becker 1965, Linder 1970). Higher-earning individuals tend not to use time-intensive activities such as libraries. If so, the proper variable to use is earnings, not income; inclusion of property income will tend to bias the coefficient toward zero. Removing the bias, however, would in all likelihood leave income still a rather insignificant factor.

[11] We tested the hypothesis that the rich and poor do not use the library by specifying use as a function of income squared as well as income. The squared term was most insignificant and positive ($t = 0.1$), and the linear term was also insignificant, implying that usage is independent of income.

survey showed that use of the library is disproportionately concentrated among students, so it is not surprising that households with children living at home make greater use of the library. Among other things, users were asked their age and their educational status. Table 4.8 shows the age distribution of library users and the age distribution of the Beverly Hills population. It is obvious that the library is heavily used by persons under 25, many of whom are students. Table 4.9 shows that nearly half of the adult users of the Beverly Hills Library in 1970 were students. What is surprising, however, is that many of them were college and university students, even though there is no college or university in Beverly Hills. The first line of Table 4.9 shows that 19 percent of all the users of the library were students in colleges and universities, while 27 percent were students in high school or below. The third and fourth lines show the educational distribution of nonstudent users and of heads of households in the community.

Not surprisingly the more highly educated households make greater use of the library than the less well educated, but the difference is not great. Thus, the major findings of the regression analysis of use based on the community survey are confirmed by the results of the user survey; namely, that the presence or absence of a child living at home is the most important determinant of household usage. Since students are the largest identifiable users of library services, and since most students are children living at home, such a result was to be expected. The user survey also showed that educational level *per se* exerts only a minor influence on use, as was found in the regression analysis of the community survey.

While students use the library chiefly for school-related purposes, most other individuals use it to obtain material for leisure reading. Table 4.10 shows the reasons given in our user survey; leisure reading and school-related assignments predominate. The large number of persons listing "Other" indicates that the question was flawed in design; using the library to obtain materials for school assignments was not distinguished from using it as a study hall. Likewise, use of the library to obtain

Table 4.8

AGE DISTRIBUTION OF ADULT LIBRARY USERS IN BEVERLY HILLS

	Under 25	25-39	40-64	65 or over	Total
Number in sample	223	91	122	29	465
Age distribution of adult users	48.0%	19.6%	26.2%	6.2%	100%
Age distribution of Beverly Hills population over age 15[a]	14.3%	17.5%	45.2%	23.0%	100%

[a]Taken from 1970 Census, preliminary data.

Table 4.9

EDUCATION LEVEL OF ADULT USERS OF BEVERLY HILLS LIBRARY

Type of User	Educational Level (percent)										
	6th Grade or Less	7th-8th Grade	9th Grade	10th-11th Grade	1 Year College	2 Years College	3 Years College	4 Years College	Some Graduate Work, No Degree	Graduate Degree	Total
Students presently in school	0.5	3.7	4.4	18.5	4.2	4.9	4.0	2.8	2.6	0.9	46.6
Students not presently in school	--	--	--	4.2	4.9	8.0	2.8	10.3	8.7	14.5	53.4
Nonstudents	--	--	--	7.9	9.2	14.9	5.3	19.3	16.2	27.2	100
Heads of households in community	0.4	0.7	0.5	17.9	7.3	13.2	7.2	26.9		25.9	100

Table 4.10

REASONS FOR USE OF THE LIBRARY

Reason	Total Number of Responses	Percentage of Total Responses
To obtain leisure reading material	165	36.2
School-related purposes	134	29.4
Job-related purposes	42	9.2
To attend lecture	2	0.2
To see film	9	2.0
Leisure reading and school-related purposes	14	3.1
Leisure reading and job-related purposes	11	2.4
School- and job-related purposes	1	0.2
Other	78	17.1
Not stated	26	--

audiovisual materials was not asked about explicitly. Both of these categories may be part of "Other."

Table 4.11 shows the cross-classification of students and reasons for library use. As expected, students use the library mostly for school-related purposes.[12] Those who indicated that they were using the public library (adult section) for a school assignment were asked whether this was because the school library did not own the material, whether the material was not in, or because they preferred the public library. Table 4.12 indicates that among all students, the most common reason was that they preferred the public library; the least common was that the school library did not own enough copies of books. Among students in grade 12 or lower (and presumably in the Beverly Hills School System), the most common reason was that the school library did not own the material they needed. In relatively few cases did the school library own the material but it was unavailable. Thus, it appears as though a large number of students would continue to use the public library even if acquisition policies of the school library were substantially changed.

The Beverly Hills Library provides services to a substantial number of nonresidents. Table 4.13 shows that three-eighths of all users are nonresidents. Classified by student status, 41.3 percent of nonstudent users are nonresidents. Of these, only 29.2 percent are employed in Beverly Hills, so that most nonresident users do not work in Beverly Hills either. Among students, 26.2 percent of high school or younger

[12] The 2.8 percent who are nonstudents using the library for school-related purposes appear to be an anomaly. They may be individuals taking some kind of extension course.

Table 4.11

REASONS FOR LIBRARY USE, BY STUDENT STATUS

(Percentage of Total Users)

User	Reasons for Use			
	To Obtain Leisure Reading	School-related Purposes	Job-related Purposes	Other (including combination)
Student	7.7	26.9	0.5	11.0
Nonstudent	28.6	2.8	9.1	15.4

Table 4.12

REASONS FOR USING THE PUBLIC LIBRARY RATHER THAN THE SCHOOL LIBRARY BY STUDENTS DOING ASSIGNMENTS

(Adult Section of Library)

Reason	Percentage of All Students	Percentage of Students in 12th Grade or Lower
(1) School library doesn't own material	33.3	44.0
(2) Material is not in school library	9.8	8.3
(3) Prefer public library	50.4	39.3
(4) All of the above reasons	0.8	1.2
(5) First and third reasons	4.1	6.0
(6) Second and third reasons	1.6	1.2
Number of students who failed to respond	8	4
Total number of students using public library for school assignments	123	88

Table 4.13

RESIDENT AND NONRESIDENT USERS OF THE BEVERLY HILLS LIBRARY

User	Resident (%)	Nonresident (%)	Total (%)
All users	62.1	37.9	100
High school student or younger	73.8	26.2	100
College or university student	55.3	44.7	100
Nonstudent	58.7	41.3	100

students and 44.7 percent of college and university students are nonresidents. Thus it appears that the library is serving as a study hall for a good many nonresident students. Part of the reason for this, no doubt, is that high school libraries, as well as the Los Angeles Public Library, are closed in the evening. In the case of college students, the Beverly Hills Library may be closer to where the students live than their college library. Since the Beverly Hills Library closes at 9 p.m., an early hour for college students, they must have few alternatives. In considering whether to expand the hours or the seating capacity of the library, it is relevant to know that a substantial portion of the evening users are nonresident students.

Additional information about the users of the library is given in the discussion of the user survey in Appendix B.

COMPARISON WITH OTHER STUDIES

The finding that students are heavy users of library services is not new. However, our study might be considered unusual in that (1) it makes a quantitative estimate of how much difference there is in usage between households with children and households without children, and (2) a number of relevant factors have been controlled for, so that the dangers of spurious correlation are reduced. As an illustration of the second point, most studies find that use decreases with age. Martin (1969), for example, finds that the percentage of persons in each age group using the Chicago Public Library decreases consistently above age 15. Table 4.14 shows his data.[13] But is this effect due to age or something that is correlated with age? In Beverly Hills, once the presence or absence of a child is controlled for, the regression analysis shows that there is no significant difference in library use among households with heads of different ages. Moreover, the presence or absence of a child is much more strongly associated with use than is age.

[13] These data are not comparable with the data in Table 4.6 since our data show visits by the person in the household who uses the library most and age refers to head of household.

Table 4.14

PERCENTAGE OF CHICAGO RESIDENTS USING THE LIBRARY, BY AGE

Age Group	Percentage
5-14	41.7
15-19	57.8
20-39	18.9
40-59	9.5
60 or over	5.6
All ages	22.3

Source: Martin (1969).

A number of previous studies have also found students to be heavy users of the library. A survey of library users in Newark, N.J., found that 61 percent were students, and a survey made in Stockton, Calif., showed that 50 percent were students (Mills 1963).[14] Berelson, in the 1947 Public Library Inquiry, found that one of three children used the public library, while only one of ten adults used it (Berelson 1949). Qualitative statements concerning this phenomenon are numerous.[15]

Some of our other findings are also confirmed in the literature. Berelson found that users of the library had larger home libraries, and we find book expenditure correlated with use.[16] Education is frequently cited as a major cause of variation in library use. Berelson says, "Another major correlate of public-library use is formal education." Most analyses have employed one-way classifications of use; that is, users have been classified by educational status, and highly educated individuals have been found to use the library considerably more. Berelson, for example, finds that college graduates are four times as likely as grade school graduates to use the library. However, we do not find the difference to be this great; 4 years of additional education are likely to add two visits to the library per year, and the relationship is not statistically significant at even a 10 percent level. There are two explanations for this: The first is the range of variation that we observe. Most of our observations are of individuals having between 12 and 17 years of education, and our result tells us that there is rather little difference among them. The second explanation is that

[14] For another comment on the Newark Library, see Roth (1969).

[15] "Traditionally libraries have been a refuge for students, who use them for study, research, meetings with friends, reading for recreation. In recent years students have become the chief users of libraries" (Conant 1965). "Children and young adults are among the heaviest users of the public library" (Mills 1963). "In middle class neighborhoods the contemporary library is desirable, with its emphasis on child, student, and non-fiction readers" (Gans 1965). "Children and young people, especially those of school age, use the public library much more than older people do" (Berelson 1949).

[16] Berelson's variable is a stock variable (number of books in the home library), while ours is a flow (book expenditure per year). Since we would guess that books are read as they are bought and read very little thereafter, the flow variable seems more appropriate. Also Berelson's analysis holds no other variables constant, such as student status or education.

we have included other explanatory variables, so that results should not necessarily be comparable. Finally, Berelson cites three studies in which the members of high economic classes are shown to use the library less than those of middle economic classes. Again, nothing else is controlled for, but this follows the same direction as our finding (although in our sample, use is nearly independent of income).

SPECIFIC REASONS FOR NONUSE

One reaction to the above analysis could be that it is interesting but not helpful. That is, if the goal of the library is to become a more effective provider of public services, then it is not helpful to know that the presence or absence of a child makes a difference in a household's use of the library. However, it is helpful to know about this in trying to predict future use. Since family size is decreasing, use of the library's services is not likely to grow rapidly.

But we also wanted to know what improvements the library could make to increase its use. Therefore, in our community survey, we asked respondents who did not use the library what their reasons were. Altogether 458 households gave one or more reasons why members of their households were not library users, although 183 of these households did, in fact, use the library. Table 4.15 shows these responses.

Table 4.15

REASONS FOR NONUSE OF THE LIBRARY

Reason	Number of Responses	Percentage of Respondents Answering
Buy books and magazines to read	218	47.6
No particular reason	155	33.8
Just haven't gotten around to getting a library card	112	24.5
Don't have time to read books	72	15.7
Other (usually sickness or recent migration)	61	13.3
Library is too far away	18	3.9
Don't know where the library is	13	2.8
Library hours are inconvenient	11	2.4

The library can do little or nothing about most of the reasons for nonuse, such as "no particular reason" or "just too busy," although improving its book acquisition policy might induce some of those who currently buy their books to use the library. Those reasons for nonuse that the library can do something about directly (such as hours) do not affect the nonusers, although they do affect the users. (See Chapter VII.) It was for this reason that the regression equations were specified without any variables that were under the direct control of the library.

V

A PROGRAM BUDGET FOR THE BEVERLY HILLS PUBLIC LIBRARY

A CERTAIN AMOUNT of literature now exists on program budgeting in libraries (Raffel and Shishko 1969; Fazar 1969; Keller 1969; Bryan and Carroll 1960; Brutcher, *et al.* 1964; Maybury 1961). In this chapter we have followed an abridged outline of Raffel and Shishko's program budget. The major abridgements are that we have made no effort to determine capital costs and that our budget is modified to make it applicable to a public library. Capital costs were excluded both for reasons of time and because, with the exception of space costs, they are small. As for space costs, the building is a "sunk cost." The relevant space costs for decisionmaking are costs of acquiring additional space. We have not studied the costs of alternative expansion plans. Since there are unused areas of the building, cost of certain expansion plans would appear to be small; hence, we feel that ignoring space costs will not be very misleading.

Table 5.1 shows the resulting program budget for the Beverly Hills Public Library. With the exception of book and serial purchase costs, and part of the very last item, miscellaneous supplies and maintenance, these are entirely labor costs. They were derived by allocating each employee's hours to a particular task; for example, a librarian might spend 20 hours cataloging and 20 hours on the readers advisory service. Her salary would then be allocated to these programs accordingly. There was undoubtedly some error in estimating the amount of time spent on the various functions; nevertheless, the approximate magnitude of the overall figures should be correct.[1] The figures show that about 70 percent of the library's operating

[1] The employees were generally asked to allocate their own hours; responsibility for gathering the figures was undertaken by Miss Carolyn Reese, Assistant City Librarian.

Table 5.1

PROGRAM BUDGET FOR BEVERLY HILLS LIBRARY

I.	ADULT BOOK AND SERIAL COLLECTION			$232,600
	A. Collection Building		$125,700	
	1. Selection		$ 13,600	
	a. Reference	$ 8,000		
	b. General	5,600		
	2. Ordering (including Children's)		12,600	
	3. Purchase Costs (including Children's)		70,200	
	a. Books	67,200		
	b. Periodicals	3,000		
	4. Cataloging		26,000	
	a. Cataloging	7,500		
	b. Filing	2,000		
	c. Typing	5,200		
	d. Revising and Miscellaneous	2,900		
	e. Purchased Services	8,400		
	5. New Item Preparation (including Children's)		3,300	
	B. Collection Maintenance (including Children's)			10,500
	1. Book Repair (rebinding)		2,600	
	2. Binding of Serials		7,900	
	C. User Services			96,400
	1. Reference Desk		20,600	
	2. Readers Advisor, excluding reserves		12,300	
	3. Reserves		5,700	
	4. Monitor		1,700	
	5. Circulation		40,700	
	a. Charge-out Desk	16,600		
	b. Overdues	5,200		
	c. IBM cards	400		
	d. Shelving	12,900		
	e. Periodicals	5,600		
	6. Interlibrary Loan (before joining system)		1,900	
	7. Telephone (labor costs)		13,500	
II.	CHILDREN'S BOOK COLLECTION NOT INCLUDED ELSEWHERE			24,100
	A. Collection Building		15,600	
	1. Selection		6,700	
	2. Cataloging		8,900	
	B. User Services		8,500	
III.	OTHER SERVICES			19,800
	A. Film Service and Record Collection		10,300	
	B. Art Collection		9,500	
IV.	UNALLOCATED COSTS			45,500
	A. Administrative Costs		20,600	
	B. Statistics		3,900	
	C. Artist		2,400	
	D. Vacation Substitutes		8,000	
	E. Miscellaneous Supplies and Maintenance		10,600	
TOTAL				$322,000

budget is allocated to salary costs; this percentage is in line with that at other public libraries (Bryan and Carroll 1960; Brutcher, *et al.* 1964). The library adds about 10,000 volumes per year and its annual circulation is around 322,000 per year.[2] Based on these figures, we can derive the average purchase price per volume, $6.72.[3] We can also find the average cost of various technical services. These costs are shown in Table 5.2. The cataloging, processing, and labor costs of acquisition are $5.55 per volume, nearly as much as the purchase price.

Table 5.2

AVERAGE COST OF VARIOUS TECHNICAL SERVICES
AT THE BEVERLY HILLS PUBLIC LIBRARY

Cataloging cost per volume added.....	$2.60[a]
Processing cost per volume added.....	0.33
Acquisition cost (labor) per volume added.....	2.62[a]
Circulation cost per book circulated.....	0.13

[a]A more appropriate deflator is per title added, but that figure was not available at the time this analysis was made.

A cost that appears frequently in the literature is total cost per volume circulated. However, the concept of program budgeting tells us that little meaning should be given to this figure because the library supplies many services other than circulation of books. Moreover, it is not appropriate to compare this cost across libraries that provide different services. Rather, cost per service should be calculated, as was done in Table 5.1.

Some cost figures comparable to those shown in Table 5.2 are shown in Table 5.3 for eleven public libraries in the State of Washington. The acquisition costs shown in Table 5.3 do *not* include book-selection costs; processing costs include book repair and the distribution of books to branches. Except for libraries 1, 2, and 11, the Washington libraries appear to be roughly comparable in size to the Beverly Hills Library. It is interesting to note that the cost figures in Table 5.3 show a large variation that does not appear to be related, in any obvious fashion, to the number of volumes or titles acquired. This variation is probably due to differences in efficiency in operating technical service activities. Varying efficiency is not unlikely, since libraries do not compete in the marketplace. Beverly Hills appears to be

[2] The 322,000 figure is an estimate based on a 10-month circulation figure of 268,000 from July 1970 through April 1971. Since May is an above-average month for circulation, 322,000 may be conservative.

[3] This compares with a purchase price of $5.86 for volumes purchased between 1966 and 1970 in our sample. Inflation could easily account for the difference.

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Table 5.3

COST ESTIMATES OF TECHNICAL SERVICES ACTIVITIES IN WASHINGTON PUBLIC LIBRARIES, 1969

Library	Titles Acquired	Volumes Acquired	Acquisition Costs	Cataloging Costs	Processing Costs	Acquisition Costs Per Title	Cataloging Costs Per Title	Processing Costs Per Volume
1	179	198	$ 313	$ 1,223	$ 428	$1.746	$6.832	$2.162
2	394	394	148	531	388	0.375	1.348	0.985
3	3,000	3,144	1,536	3 510	2,607	0.512	1.170	0.829
4	3,676	6,769	4,800	7,490	3,233	1.306	2.038	0.478
5	3,918	5,82.	3,041	4,013	1,956	0.776	1.024	0.336
6	4,207	13,491	2,174	7,567	10,051	0.512	1.799	0.745
7	5,100	5,400	2,022	6,534	3,019	0.396	1.281	0.559
8	5,652	11,413	2,688	7,809	6,966	0.476	1.382	0.610
9	6,009	21,134	19,526	16,984	13,769	3.249	2.826	0.652
10	6,200	7,219	5,480	15,971	5,920	0.884	2.576	0.820
11	11,305	77,100	48,147	57,961	25,703	4.259	5.127	0.333
Average	4,513	13,826	$ 8,170	$11,781	$ 6,731	$1.810	$2.611	$0.487
Median	4,207	6,769	$ 2,688	$ 7,490	$ 3,233	$0.884	$2.038	$0.745

Source: Table 3.2 in Reynolds et al. (1971).

somewhat on the high side in acquisition costs, but this is no doubt due to the inclusion of selection costs in the library's figures. In processing costs, Beverly Hills seems to be on the low side. Inclusion of book repair would raise the figure to $0.59 per volume, which is nearly the same as for the Washington libraries. The cataloging figures are also nearly the same. Thus, Beverly Hills figures seem very similar. However, in the State of Washington, libraries are likely to be in small, isolated communities where wages are lower; also, the data are from 1969, when wages actually were somewhat lower; thus, Beverly Hills may be doing somewhat better than the Washington libraries.

Niland (1967) has analyzed some data from the Washington University (St. Louis) Library to determine the cost of acquisition, cataloging, and circulation for that library. His figures for the three functions are $1.95, $2.14, and $0.76, respectively. The last time period for which Niland has actual data is 1964-1965. The average costs of the functions in that year were $1.71, $2.37, and $2.08, respectively. Again the Beverly Hills Library is slightly high in its acquisition costs, probably because selection costs are included, but well below in its circulation costs. The wage qualification mentioned above is particularly applicable here, since the data come from a considerably earlier time period.

In sum, the Beverly Hills Library appears to operate its technical service activities with average or better than average efficiency. However, cost comparisons such as these can be very misleading. Apart from differences in wages and other factor prices, there can easily be differences in accounting practices that make the numbers incommensurate. Hence, these comparisons are not definitive.

What, then, are numbers such as those shown in Tables 5.1 and 5.2 useful for? First, if the librarian has some notion of what a given service "ought" to cost, such numbers can point out areas that need special attention. Second, if gathered each year, they can show which library functions are increasing the most rapidly in cost and hence may need more careful management. Third, costs of acquisition affect the benefit/cost ratios calculated in Chapter III. Fourth, cost figures are useful for determining whether it would be worthwhile to purchase certain services on the market. For example, the California State Library offers a cataloging service for a certain price, but a library cannot know if this service would be worth purchasing without knowing its own cataloging costs. Also, there are now a number of possibilities for automating a library's circulation system,[4] but, again, alternatives cannot be compared without knowing costs. **Since the cost of gathering data of the kind shown in Tables 5.1 and 5.2 is low, it would seem expedient for all public libraries to do so on a regular basis.**

We can make a very rough guess at the average costs of the reference and readers advisory services. Based on our user survey of all persons entering the library during seven different 2-hour periods in March 1971, the number of visits per year would appear to be slightly over 200,000. This may be an overestimate, since March is a very busy month at the library, but the figure must be taken as very

[4] These will be discussed in Chapter VI.

approximate in any case.[5] In our survey, 7.3 percent of the entrants said that they used the readers advisor and 12.0 percent said that they used the reference desk. Since those who filled out the questionnaire were probably more likely to use these technical services than those who did not, these percentages are probably somewhat overstated. From these figures, however, we determined that approximately 15,000 persons per year use the library's readers advisor and 25,000 use the reference service. (There are, of course, also telephone users.) Dividing the resulting visit figures into the annual cost figures shown in Table 5.1, we get $0.82 per visit as the cost of both of these services. This figure is subject to two biases that work in opposite directions: The probably overestimated number of visits tends to bias the cost estimates downward, while our ignoring telephone users, especially for the reference service, tends to bias the cost figures upward. We have not found any cost figures with which to compare ours; but even if we had, the comparison would be much more difficult than that of the technical services because the scope for quality variation is probably greater.

[5] This is for two reasons: First, on several days the number of entrants had to be estimated after the fact (see Appendix A). Second, the distribution of the 2-hour periods in our survey may not correspond well to actual busy periods at the library.

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VI

CIRCULATION CONTROL AND INFORMATION SYSTEMS

IN THIS CHAPTER we discuss several alternative computerized systems for controlling book circulation and for providing information useful to the librarian. The costs of these systems are estimated and their individual performances are compared with the performance of the circulation control system presently used in the Beverly Hills Library. In addition, the procedures for processing overdue notices are analyzed to determine the potential cost savings achieved by delayed processing. Several suggestions are made for increasing the efficiency of the library's charge-out function.

CIRCULATION SYSTEMS

The dimensions of a circulation system and the determinants of its cost include such factors as total circulation, book collection, number of patrons, number of overdue notices, etc. Circulation data from the Beverly Hills Library are given in Table 6.1. On an average day, approximately 1000 books are borrowed by 250 patrons (2000 in and out transactions). About 160 overdue notices are sent out each week.

The library's circulation system is presently designed chiefly to provide notices of overdue books. When a book is checked out, three cards are photographed onto microfilm: the borrower's identification card, a book identification card, and a prepunched transaction card bearing the due date for the book and a sequential transaction number for that date. (Each book borrowed during the day has a unique transaction number.) The transaction card and book card are placed in the book. On the book's return, the transaction card is removed and filed with other transaction cards

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Table 6.1

CIRCULATION DATA FROM THE BEVERLY HILLS PUBLIC LIBRARY, 1970-1971

Total collection (volumes)	120,000
Total circulation (volumes per year)	322,000
Average number of circulating books	12,400
First and second overdue notices (number per year)	8,700
Registered patrons	16,000

bearing the same date. Two weeks after the due date, the returned transaction cards for all books due on that date are machine-sorted, and the missing cards are listed.[1] These missing cards represent all books borrowed on the given date that have not been returned. The microfilm for that date, sequenced by transaction number, is then searched for borrower and book information, and overdue notices are prepared.

This system performs its major function quite efficiently and cheaply, but it does very little else. The microfilm record cannot be resequenced and it is difficult to search. Since there is no record of which books are circulating at a given time, one cannot tell whether a book that is not on the shelf is checked out or lost. Also, statistics on the circulation frequency of different sections of the collection are very difficult to compile.

Systems are available that can provide a broader range of services but at a cost that increases with the complexity of the tasks demanded. Almost all of the libraries that have converted to automated, computer-controlled systems have found that the new systems cost more to operate than the old. In addition to the increased costs of the system, nonmonetary costs, such as those resulting from disruptions to the library's staff and inconvenience to its patrons, will probably be incurred while the new system is being installed. For example, in a "Management Audit Report" of the Los Angeles City Library (Piper 1969), it was noted that problems were encountered —some lasting over a year—in every part of the automated system, despite the fact that each part was automated separately to minimize the disruption and cost that total, simultaneous conversion would have entailed.

The typical library circulation control and information system requires information that will enable it to (1) identify the book, (2) determine who has borrowed it, and (3) determine when it was taken out or due back. All systems provide methods for collecting this information and placing it into the control system, for processing the information, and for extracting various reports (which are simply rearrangements or summaries of the original information). However, a critical bottleneck seems to occur in collecting the information and in converting it into a form that is readable by machine. This part of the system should be convenient to operate, fast, precise, and cheap, but devices that satisfy these criteria are not easily found. To a

[1] The small amount of data processing mentioned above is performed for the library by the data processing department of the City of Beverly Hills on unit record (card) equipment.

large extent, this lack reflects the absence of demand. Until quite recently, computer processing was too expensive for the relatively simple requirements of public libraries; thus, demand for devices peripheral to the main operation was small. Now that computer processing has become relatively cheap, there is an increasing demand for such devices. Although new technologies are opening up several avenues for the potential solution of the problem, so far very few devices have proven satisfactory in actual practice.

Some of the more promising devices and techniques that are available are discussed below in the context of three computerized circulation systems in which they might be used. These systems range in complexity from a very simple system that is merely tacked on to the present one to a deluxe system in which all the data are on the computer and all processing is automatic. System costs are analyzed in the next section.

The Bare-Bones System

In this system almost all processing is performed in the same manner as it is now. From the microfilm, the transaction number, due date, and book accession number[2] are transcribed onto a machine readable medium, such as a punch card or optically readable paper. These records will update a file of circulating books. The file can be resequenced by accession number to provide a current list of circulating books and their due dates. Transaction cards from returned books will delete records from the file. The present data-processing work could be completely eliminated by this system. Overdue notices, however, would still have to be prepared from the microfilm.

This system has several advantages: It is simple, makes hardly any change in the present system, provides a list of books that are in the borrowers' hands, and can be used to begin to collect statistics on circulation. Its main disadvantage is that the small amount of information limits its usefulness. The system does satisfy one major demand: It provides the librarian with a list of circulating books. Somewhat more can be accomplished by transcribing additional information from microfilm (for example, call numbers). But if more and more information must be transcribed from microfilm, it might pay to go to a more complex system.

Patron File Computerized System

A higher-cost alternative system places the patron file on a machine readable medium. This file will include name, address, unique patron identification number, and other relevant information. If the transaction number, due date, and book accession number, plus borrower identification, are available to the computer, overdue notices can be prepared automatically. However, the only way to identify the

[2] The book accession number is the only available simple characteristic that uniquely identifies each book. The deficiency of this identifier is that it carries no meaning other than the sequence in which the books were added to the library's holdings.

book is by accession number, unless additional information can be included in the system. Several possibilities exist for using the book charging operation to generate a computer record:

1. *Microfilm:* The computer record could be transcribed from microfilm as in the first system. Certain book information, such as author, title, or call number, could also be transcribed, thus allowing a more complete overdue notice to be prepared.

2. *Bro-Dart Kompunch:* The Kompunch device takes identification information from machine readable patron and book cards and combines it with a date. It then prepares two new punched cards bearing the combined information. One of these cards stays with the book to discharge it later upon its return to the library; the second card is used to update the computer system. Again, this system is deficient in that only the book accession number is available for overdue processing. This can be remedied somewhat by adding more information to the book card, but at a cost of slower charge-out speeds.

3. *Colorado Instruments C-Dek:* The C-Dek is a computer terminal device that need not be used on-line with a computer. Like the Kompunch, it accepts patron and book cards and prepares a record for the computer. It is flexible in that it can prepare several kinds of output—magnetic tape, paper tape, punched cards; it can be attached directly to a computer or used alone. C-Dek operates more quickly than the Kompunch. A disadvantage is that returning books must be discharged by placing the book card in the device, whereas in the Kompunch system, the discharge card is prepared when the book is charged out.

4. *Handwritten Charging Cards:* These cards could be filled out by either the borrower or the charge-out clerk, or by both. For example, the book identification could be filled in by the borrower and verified by the charge-out clerk. The borrower's identification could then be imprinted by a credit-card-type imprinter. This system is used at the American University and several other university libraries. Alternatively, the clerk could fill in the book information and imprint the card; or the borrower could fill in both numbers. One of these cards would then be sent for keypunching or other processing, the duplicate staying with the book for discharge purposes.

There are potential problems with this system. If the charge-out clerk fills in the book identification, the transaction will take longer. The borrower may have difficulty in accurately and legibly writing down the correct information. The possibility of error is greater with this system than with any of the others. The chief advantages are that no machine readable book card is required at the charge-out desk and that the borrower could assume part of the workload.

None of the four techniques described above is ideal. The ideal device would create a machine record at the instant the book is charged out, thus obviating any need for further processing. It would also make use of prerecorded book, borrower, and date information, thereby reducing the possibility of error. Speed of operation is also essential in a busy library. Each transaction should take no more than 10 seconds. Since all of these features must be paid for, price is an important variable and will be analyzed under "System Costs," below.

Patron File and Book File Computerized System

In the deluxe system, the patron file and all the book information are on a machine readable medium. With this system, almost all of the circulation system can be automated. Overdue notices with full borrower and book information can be prepared automatically, as well as full information on books outstanding. Historical data on circulation by book or by book type can be collected. Eventually such a system can be incorporated into the cataloging system, perhaps eliminating entirely the present card catalogs.

Input options are the same as in the preceding system, but the information requirements are simpler, since all information on borrowers and books is held in the system, except for the simple identification numbers characterizing each transaction.

The chief disadvantage of this system is the high cost and the labor required to convert the book file to a machine readable medium. Also, the cost of running and maintaining the system will be higher than for the simpler systems. The advantages are obvious. Almost anything that one wished to do with an automated system is technically feasible, limited only by the universal constraints of money and imagination.

SYSTEM COSTS

Costs of operating the present overdue notice and circulation control system can be obtained from the program budget given in Table 5.1, supplemented by additional information. As can be seen from Table 6.2, the principal cost arises from the labor devoted to preparing and mailing overdue notices.

We shall first discuss the costs of the four alternative techniques of placing circulation information into the system.

1. *Microfilm:* The cost of transcribing information from microfilm to punched cards can be computed from a typical all-inclusive service bureau rate of $54.61 per thousand cards. At 26,000 transactions per month, this cost amounts to $1,420. This task could also be performed in the library and would require the rental of a keypunch machine, the purchase of cards, and the wages of a keypunch operator. This in-house cost would be $800 per month—a substantial saving over service bureau rates.

2. *Bro-Dart Kompunch:* The Kompunch rents for $130 per month and uses two punched cards per transaction. Cards cost $4 per thousand. At 26,000 transactions each month, the card cost would be $208. Kompunch operating speeds depend on the amount of information to be processed. For any but the minimum amount of information, the speed is slow enough to require two machines at peak periods. With the rental of two machines, the total cost is $468 per month. This machine is still in the prototype development stage and the one library using it has expressed dissatisfaction with its operation.

Table 6.2

PRESENT CIRCULATION CONTROL SYSTEM COSTS

Overdues preparation (labor cost)...	$5,200
IBM cards.....	400
Postage (estimated).....	800
Rekordak Microfilmers.....	460[a]
Total annual costs.....	$6,860[b]
Monthly costs.....	570

[a]Rekordaks treated for comparison purposes as though rented.

[b]Charge-out desk personnel treated as constant.

3. *Colorado Instruments C-Dek:* The C-Dek terminal rents for $125 per month. This terminal must be connected to an output device and the most likely one is the Mohawk Data Systems Key-Tape machine. The Key-Tape takes the electronic signals from the terminal and places them directly onto magnetic tape that can be fed into a computer. This operation does not require the intermediate conversion of the information into punched cards. The Key-Tape rents for $135 per month. The terminal and tape combination is very fast, operating at electronic speeds. Up to 126 characters of information can be handled, without loss of speed. If one terminal is all that is required, the total rental would amount to $260 per month. Two terminals would increase the cost to $385 per month. Over ten libraries are using this system at the present time. The devices have been well tested through actual use and two libraries that have been questioned expressed complete satisfaction with the system.

4. *Handwritten Charging Cards:* The cost of handwritten cards would be at least as great as technique (1), since each card would have to be keypunched. Because of the other problems involved with this method, including speed of operation and errors, it will not be considered further.

Techniques (1) and (3) seem to be the only likely ones for possible use. In fact, the C-Dek terminal system is considerably cheaper than manually transcribing the microfilm to punched cards. In costing the full systems, we shall therefore assume that the Colorado Instruments C-Dek and Mohawk Data Systems Key-Tape are the devices to be used in all but the simplest system.

When the costs were calculated for the first three systems, it was discovered that a hybrid system, composed of parts of the two more complicated systems, could be designed. The hybrid system would combine the best features of both of the others at a monthly cost that would be only slightly more than the cheaper of the two, and at an installation cost somewhat cheaper than the more expensive. For this system, it would be necessary to prepare a punched book card with the book's accession number and any other information that might be useful and would fit into the 80 columns of the card. For example, Dewey decimal number, title, and author could

be punched into the card.[3] This information would be placed into the computer system only when the book was circulating, thereby relieving the system of the requirement of processing 120,000 records during each run. If desired, a duplicate file of book cards could be prepared and additions and deletions accumulated. When required, these cards could be processed by the service bureau to provide an inventory list in several sequences. The cost of a complete list of all books in the library in any two sequences would be approximately $2000. The hybrid system could also provide overdue notices with full name and address and book information and lists of circulating books in several sequences. (The cost figures assume the weekly generation of lists of circulating books in two sequences, the preparation of overdues, and the generation of data for the study of circulation.)

Turning now to full system costs, Table 6.3 presents a summary of the costs of the systems described above. The costs are broken down into three parts: one-time installation costs; processing costs charged by a computer service bureau; and processing costs incurred by the library. There is some possibility of shifting certain tasks (mainly keypunching) from the library to the service bureau, or vice versa. Keypunching would be cheaper if performed in the library, especially if the person assigned to do this job full time were able to develop a high degree of proficiency.

There are two possibilities of reducing the costs shown in Table 6.3. One is not to verify all data transcribed onto punched cards, but only the important identification numbers. Another is to use an alternative method of setting up Systems A and B. Instead of the entire circulation list being placed into the system at one time, only new circulation would be added as new transactions took place. After 4 weeks, all but 1.5 percent of all circulating books would be in the system.

It should be firmly emphasized that these costs are approximate and are intended to indicate the general range that might be expected and the relationships among the various systems. One cost that has not been computed is the preparation of machine readable patron cards. This cost depends on the number of patrons and the card file and would be the same for all the systems.

The surprise of Table 6.3 is that the monthly cost of System A is not much less than that of System B or D, and it can be more expensive. System C, which is the most automated, is by far the most expensive in both installation and variable costs. Annual costs would amount to at least $42,000. The choice among the systems would therefore be between System B and System D, the hybrid system. The latter system would provide a higher quality output and would have a greater potential for growth in exchange for higher installation costs.

The monthly cost of these systems could be substantially reduced by purchasing the equipment. Purchase, rather than rental, would shift the cost to the installation phase. The purchase price of the C-Dek terminal is $4500, while that of the Key-Tape is $5000. The installation cost of a one-terminal system would then rise by $9500, while the monthly charge would fall by $260. The monthly cost of the hybrid system would be $1540, or nearly $18,500 per year. This system would replace, almost entirely, the present overdue notice and circulation systems. Since the replaceable

[3] A shortened form of author and title might have to be used.

Table 6.3

COSTS OF FOUR COMPUTERIZED CIRCULATION SYSTEMS

System	Installation Costs ($)	Processing Costs ($ per month)	Library Costs ($ per month)	Total Monthly Cost ($)
System A: Bare-Bones System	1,075-2,275[a]	750	800-1,420[b]	1,550-2,170
System B: Patron File Computerized	7,350-10,550[a,c]	1,440	260-385[d]	1,700-1,825
System C: Patron File and Book File Computerized	11,800-17,000[c]	3,215-3,300[c]	260-385[d]	3,475-3,685
Hybrid System D: Patron File Computerized and Fully Punched Book Card	8,750-13,950[c]	1,540	260-385[d]	1,800-1,925

[a]Lower figure assumes only new transactions added to system.

[b]Higher figure computed at computer service bureau rates. Lower figure computed as in-house library task.

[c]Lower figure includes savings from not verifying all data.

[d]Lower figure is based on one C-Dek terminal; higher figure is based on two terminals.

portions of the present system cost approximately $6000, the net annual increase would be $12,500 (plus, of course, the $18,250 to $23,450 for installation charge). For this not inconsiderable amount, the library would have a weekly printout of circulating books (more frequently at $175 a time), the potential for printing periodic lists of the entire collection, the raw material for analysis of circulation, and an automatically printed mailing list of patrons. If the computing services were performed by the city rather than by a commercial organization, the costs would be substantially lower, especially if there were excess capacity on the city's computer.

How reasonable are the numbers described so far? We can examine the experience of other libraries for some rough comparisons. The American University system is basically our System B with handwritten credit-card imprinter input. Their circulation volume is 40 percent of that of the Beverly Hills Library. Data processing costs are $27,000 per year and installation costs were approximately $10,000. The 1965 cost of a data processing system (not computerized) at UCLA was $60.84 per thousand circulation, or $19,500 given the Beverly Hills circulation figures. Harvard's Widener Library system would cost Beverly Hills $24,000 per year, again at 1965 prices. A report on the UCLA and Harvard systems concludes that "none of the users believes that the new system is more economical than the manual system it has replaced."[4]

Automation of the circulation system could be done in an incremental fashion. The first step would be to implement System B, the major task being to automate the name and address file and to place into each book a card showing the book's accession number. Since only the accession number would be contained in the system, the card catalog would have to be searched for additional book information in the processing of overdues. When this system was operating smoothly, its deficiencies could be compared with the expense of preparing a full book card for each book to avoid the manual search.

A decision to adopt any of the data processing systems must rest on the value of the benefits provided. The present system used by the Beverly Hills Library operates effectively and efficiently even though its output is rather limited. It is not on the verge of collapse through being overloaded. Based on the survey results and analysis of Chapter IV, total library circulation is not likely to grow much beyond the present volume because of the decreasing proportion of children in the community's population. Thus, the burden on the system is unlikely to get much heavier. Suppose, for example, the hybrid system were being considered. The question must be asked "Should the library spend $20,000 to install and $12,500 per year for the various benefits the system will provide?[5] What else could the library or the city do with this money?" Such questions cannot be answered by outside analysts; they must be faced by the librarians and the City of Beverly Hills.

[4] *Library Technology Reports*, "The Use of Data Processing Equipment in Circulation Control," American Library Association, July 1965, p. 11.

[5] These figures assume purchase of the equipment.

OVERDUE NOTICES

A substantial share of the cost of the present circulation system is due to the processing of overdue notices. As shown in Table 6.2, this cost is approximately $6500 per year, and is roughly proportional to the number of notices prepared. One way to reduce these costs is to delay the processing of overdue notices in the hope that enough books will be returned during the extended period to warrant the delay. In order to analyze whether a delay would yield the desired benefits, data are required on the rate at which borrowed books were returned to the library. These data were compiled from the book sample used in Chapter III. Figure 6.1 shows the cumulative percentage of books returned after the specified number of days since they were first borrowed. Thus, 32 percent of all books borrowed are returned by the 10th day, and 91 percent by the 18th day. These same data are presented in a somewhat different form in Fig. 6.2, which shows the percentage of books returned *each* day since the day on which they were first borrowed.[6] For example, 5.5 percent of all books are returned on the 7th day after they are first borrowed. It can be seen from this chart that there are peaks at the 7th, 14th, and 21st day, the major peak occurring at the 14th day, when the books are due. These peaks indicate a certain repetitiveness on the part of borrowers' trips to libraries, with a tendency to return on the same day of the week.

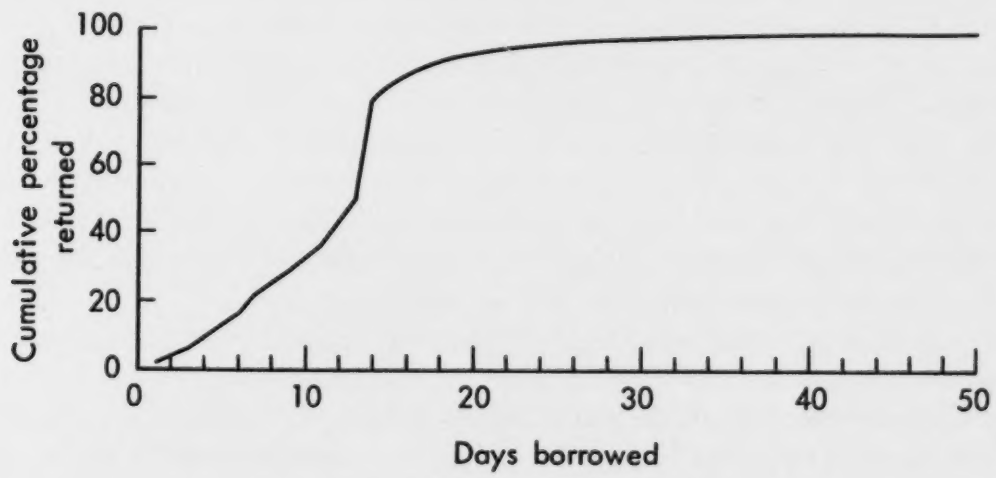

Fig. 6.1—Cumulative percentage of books returned after specified number of days since first borrowed

Figure 6.3 is the most useful in analyzing overdues. In this figure, the right-hand portion of Fig. 6.1 is emphasized and the vertical scale is greatly enlarged. On the 28th day (2 weeks overdue), about 2.85 percent of all books that have circulated

[6] The exact figures are given in Table 7.2 in Chapter VII.

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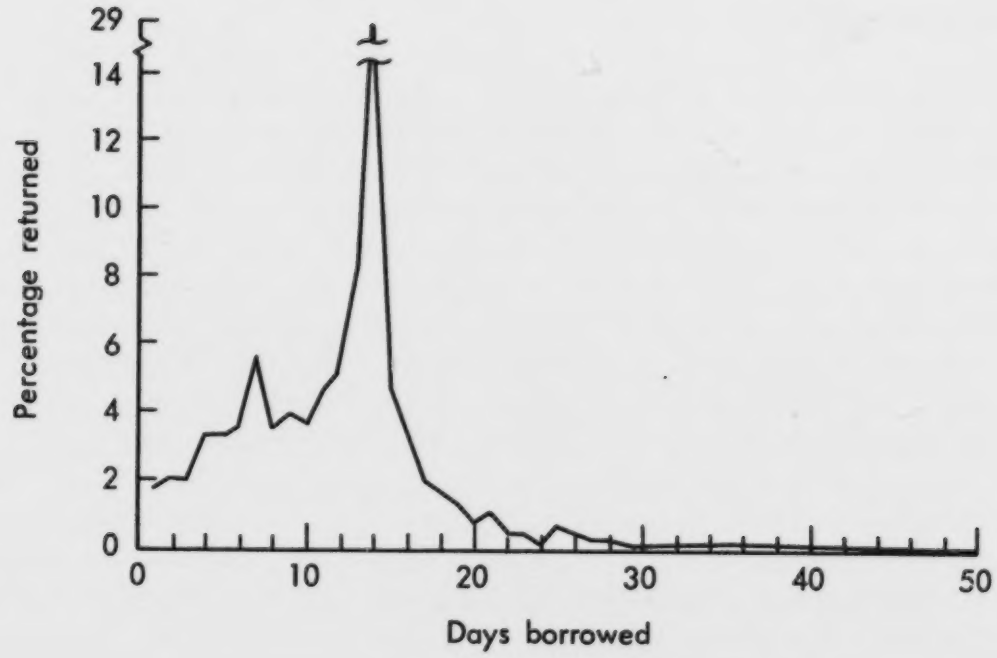

Fig. 6.2—Percentage of books returned each day from first day borrowed

are still overdue. The sensitivity of the number of overdues to shifts in the processing date can be estimated from Fig. 6.3. Extending the period from 28 days to 35 days reduces the percentage outstanding from 2.85 percent to 1.65 percent—**a 42 percent decrease.** That is, by delaying the processing of overdue notices by 1 week, 42 percent fewer notices would have to be prepared, with a resulting annual savings of about $2700. If such gains can be derived from a 1-week delay, why not delay 2 weeks? Further gains would be smaller due to the flattening of the curve beyond 35 days. An extension to 42 days would save an additional $1600 per year, considerably less than the $2700 resulting from the 1 week's delay.

It may be argued that the shape of the curve depends on the fact that overdue notices *are* sent out at a certain date, and that shifting the date would also shift the curve. This argument would be more tenable if there were evidence in the curve of a sudden jump in returned books after the notices were received by the borrowers. No such jump is observable in the data. In fact, the main impression to be gained from inspection of the curve is the smoothness of the return process. One might conjecture that the return rate is more strongly determined by the overdue fines that are accumulating or by some other process than by the receipt of an overdue notice.

There are two possible disadvantages in delaying the sending of overdue notices. Many borrowers may find the notices to be a convenient reminder; and books that are in borrowers' hands are not available for recirculation. If the notices do not actually cause the books to be returned any sooner, these points are not really valid. Perhaps it would be worthwhile to experiment with delays of various lengths in order to determine their effectiveness.

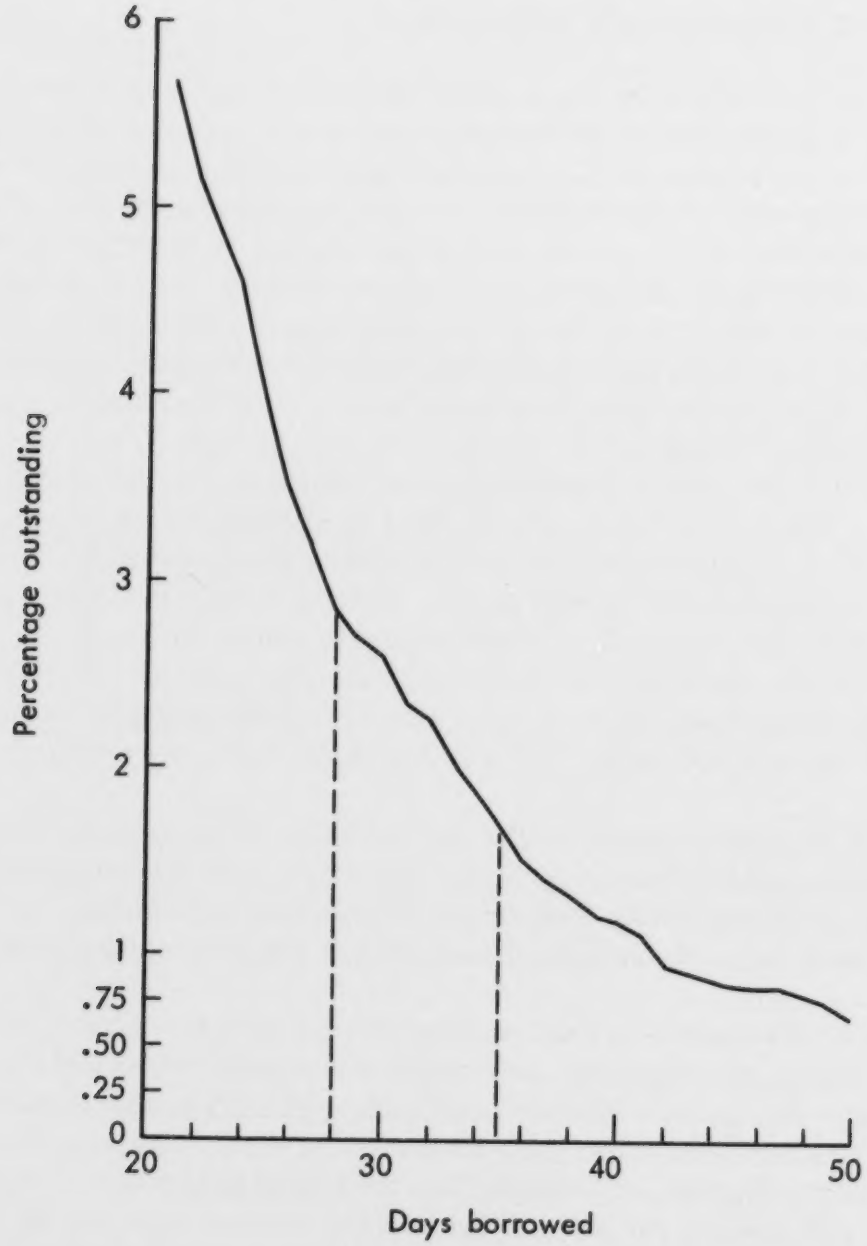

Fig. 6.3—Percentage of books still outstanding after specified number of days since first borrowed

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INCREASING CHARGE-OUT EFFICIENCY

The charge-out desk is the one point in the library that most patrons contact each time they use the library. Inefficient operation of the charge-out function will adversely affect the greatest number of people, and may also increase library costs. A major problem seems to be the priority or queueing system. As now structured, there is no way to establish priority for patrons wishing to check out books, since they can station themselves anywhere along a broad desk. This is of little consequence during normal periods, but at very busy times it can lead to delays and inefficient operation, as well as to increased costs when additional charging devices are required. By some reorganization, fewer devices may be needed to handle the load. The following suggestions are directed toward this end.

The establishment of a well-ordered queue through the use of railings or other structural modifications will increase efficiency by allowing the charge-out clerk to remain at one work station where all the materials and devices required for the job are located. If the queue runs along the desk or other work surface, it will be easier for the patron to open his books as required and to search for his library card. As the queue lengthens, a second person can be stationed before the charging device to prepare the books to be handled by the charge-out clerk. Only when waiting time in the queue becomes excessively long will it be necessary to use a second charging device.

When two or more charging devices are used, the optimum queueing system is to form a single queue serviced by the several devices, with the lead person in the queue going to the first device that is free. This technique is superior to separate queues because a delay at one point does not delay everyone who happens to be in that line.

There are well-established relationships between the time required to service a patron, the arrival rate of patrons, the number of charging devices, and the average waiting time in the queue. A knowledge of such relationships will permit a better analysis of the charging process. Table 6.4 shows the effects of varying the parameters of the system. Suppose, for example, that the typical peak rate of arrival during the day were 80 patrons per hour. If the average waiting time is to be kept to 1 minute or less, an average service time of 30 seconds is required when one charging device is used. Increasing the service time to 1 minute will require the purchase of a second device in order to service the same number of people with the same average delay. During particularly busy times, with one device and a 30-second service period, 102 patrons can be serviced, but the average waiting time will lengthen to 3 minutes.[7] The lesson from Table 6.4 is that it may pay to take measures to speed up servicing in order to avoid purchasing an additional charging device.

[7] If the average service time is 30 seconds, why cannot 120 people be taken care of in an hour without any delay at all? The answer is that people do not arrive at the desk with perfect regularity. There is a random rate of arrivals and a random distribution of service times. This randomness means that the queue may be empty at some periods and rather long at others. Nevertheless, average delays can be computed, given the average rate of arrivals and service time.

Table 6.4

EFFECTS OF VARYING PARAMETERS ON PATRON WAITING TIME

Average Waiting Time	Number of Charging Devices	Number of People Serviced Per Hour When Average Service Time Is:		
		1 min	45 sec	30 sec
1 minute	1	30	45	80
	2	87	120	198
	3	144	196	312
2 minutes	1	40	58	96
	2	99	139	216
	3	156	220	336
3 minutes	1	45	64	102
	2	106	144	228
	3	168	224	354

Source: Bowman and Fetter (1957).

Note: Assumes exponential distribution of arrivals and service time.

VII

SOME SUGGESTIONS FOR THE LIBRARY

THE PRIME INTENT of this study was to focus on some of the problems faced by medium-sized public libraries in general and to suggest some tools for solving them. A second intent was to find out what the particular problems of the Beverly Hills Public Library are so that we could offer some suggestions for their solution. In other words, while this study should not be regarded as the report of management consultants who have studied the problems of a specific library, we have attempted to understand something of the problems distinctive to Beverly Hills. Our chief instruments were two surveys—a user survey and a community survey. Both were structured around the question: "How can the library improve its service to its patrons?" Opinions were solicited on possible new services. Questions were also asked about specific aspects of the library, such as "Is the library too noisy?" In this chapter we report our findings.

HELPFULNESS OF THE PERSONNEL

In both surveys there were some complaints that library personnel were cold or discourteous. Although this opinion stands out vividly when written as a comment, its significance is somewhat belied by another set of statistics. We asked those who used the readers advisor and the reference desk whether the personnel had been helpful. In each case over 90 percent of the respondents thought that they had been. Although a number of patrons who did not use these services also answered the question about whether the personnel had been helpful, their responses do not change the results. Similarly, those who had asked the children's librarian questions were queried as to whether she had been helpful; 89 percent said she had been. We must also consider the fact that the librarian may not have been cold or discourteous

to those who said that she had not been helpful; these individuals may simply have asked unanswerable questions.

It is possible that there was a Hawthorne effect—that is, library personnel may have adjusted their behavior during the time of the survey. One respondent to both user and community questionnaires praised the idea of the survey and said that she thought that after the community survey, library personnel had become friendlier.

PUBLICITY ON LIBRARY ACTIVITIES AND A BOOK-BY-MAIL PROGRAM

A number of patrons complained that they had no knowledge of the library's services. In fact, a number of respondents to the community survey thanked the library for sending them a questionnaire and thus reminding them of the library's existence. Indirect evidence that more publicity might be useful is provided by the responses to the following question:

> Would you participate in the following "borrow-by-mail" program: For $3 per year the library would send you every month a list of its newly acquired books. If you wished to borrow a book on the list, you could phone the library and they would send you a copy of the book by mail as soon as the book is available. The book could be returned by mail or through the night depository if it is inconvenient to return the book when the library is open.

Of the respondents, 44.5 percent replied "Yes, I would participate"; another 22.9 percent said they were "Not sure." Only 32.6 percent said "No, I am uninterested." Even allowing for a considerable upward bias in the replies (that is, individuals who think they would make use of such a service but would not if it were actually offered), there still appears to be a substantial number of households that would participate. For example, if it is assumed that none of the nonrespondents to the survey would participate, and that none of those who replied "Not sure" would participate, over 25 percent of the households in Beverly Hills would participate. Moreover, many persons wrote comments beside this question, such as "Great idea!"

The book-by-mail service offers both greater publicity and the saving of time. However, if we analyze the variation in which households are likely to favor such a program, there is an inference that many households responded to it because it would afford them an opportunity to acquire additional information, not because it would save time. We followed a technique similar to that in Chapter IV to determine the likelihood that a household would want to utilize the book-by-mail program. Specifically, we estimated the following equation:[1]

[1] The figures below the numbers in parentheses are standard errors; they indicate that the association between each variable and the probability of desiring the program is such that in three of the four cases, an association this close could have arisen by chance less than one time in one hundred if in fact there were no association and in the fourth case (male labor force participation), less than five times in one hundred. That is, three of the four coefficients are significant at the 1 percent level; the fourth is significant at a 5 percent level.

Probability of Desiring Book-by-Mail Program = 0.47 − 0.19 Age variable
(0.036)
+ 0.12 Female Labor Force Participation variable
(0.028)
+ 0.064 Male Labor Force Participation variable
(0.028)
− 0.00055 Annual Expenditure on Books, $R^2 = 0.09$, n = 1162.
(0.00015)

(The variables used were: The dependent variable, the Probability of Desiring the Program, took the value 1.0 if the household response was "Yes, I would participate," 0.5 if "Not sure," and zero if "No." The Age and Labor Force variables took the value 1 if the head of the household was over 65 and if the household included an employed member of the relevant sex, respectively; otherwise they were zero. The Book Expenditure variable was measured in hundreds of dollars.)

What the equation shows is that households with heads over 65 are 19 percentage points less likely to want to participate than those under 65; households with employed males and females are more likely to want to participate; and those who buy more books tend to participate less, but the absolute effect is very small (a household that spends a thousand dollars more on books annually than another, other things equal, is half a percentage point less likely to want to participate). These results are as expected: The book-by-mail program saves time and thus it should appeal to those who have a high value for time. The employed tend to place a high value on time; the aged, a lower value.

Two inferences can be drawn: First, although the aged are less likely to use the library (see Chapter IV), this does not appear to be due (on balance) to infirmities of old age that hinder travel. If such were the case, one would expect this program to have relatively great appeal to the aged, but the opposite is the case. The truth is, the aged, on average, are simply less interested in using library services.

Second, the variance explained is only 9 percent of the variance in the dependent variable; that is, there is a great deal of variation that is not accounted for by value-of-time variables.[2] Since the other major reason for having the program is that it provides information about new acquisitions, we can infer that the desire to obtain such information motivated a number of households to want to participate in the program. If so, it means that the community wants more information about the library and is willing to pay for its dissemination.

Still another indication that publicity on the library's services is not very effective came from answers to the following question asked in the community survey: "Do you know about the special collection of books on late 19th and 20th century art that the Friends of the Library are building?" Although this had been one of the major projects at the library in the past few years, only 13.2 percent of the households answered "Yes"; 86.8 percent answered "No." Allowing for nonrespond-

[2] Still another value-of-time variable, income, is not related to the likelihood that the household will wish to participate.

ents would probably raise the "No" percentage even higher. We also analyzed the variation among households in knowledge of the art book collection. Specifically, we estimated the coefficients of the following equation:

$$\begin{aligned}\text{Probability of Knowing about the Art Book Collection} &= -0.017 \\ &+ \underset{(0.027)}{0.096}\ \text{Cardholder} + \underset{(0.00050)}{0.0011}\ \text{Household Income} + \underset{(0.00049)}{0.0014}\ \text{Visits per Year} \\ &+ \underset{(0.0015)}{0.0033}\ \text{Number of Years a Resident of Beverly Hills} \\ &+ \underset{(0.0062)}{0.010}\ \text{Years of Education of Head of Household,}\ R^2 = 0.05,\ n = 875.\end{aligned}$$

(The variables are defined as follows: If the household knew about the collection, the dependent variable was set equal to 1; otherwise it was zero. If an adult in the household held a card, "Cardholder" was set equal to 1; if only a child held a card, it was 0.5; otherwise it was zero. Household Income was measured in thousands of dollars. The other variables are straightforward. Cardholder and Visits per Year are significantly different from zero at the 1 percent level. Income and the Number of Years a Resident are significantly different at a 5 percent level.)

These results show that it is essentially random whether or not a household knew about the art book collection. If the household held a card, it was only 10 percentage points more likely to know. The other variables exert even less influence upon the probability of knowing; for example, a college graduate is only 4 percentage points more likely to know about the collection than a high school graduate.

To improve information about the library, a mailing list could be established. Such a list should not be very expensive to compile, particularly if the patron list is already stored in a computer. Those on the list would then receive information about new acquisitions and cultural events at the library, and perhaps about other cultural events in Beverly Hills and Los Angeles. Even if a machine-readable patron list is not available, the expense of a mailing list would consist of staff time plus the cost of supplies and postage. For a mailing list of 2000, with one mailing per month, the postage would be $408 per year, or 20 cents per household.[3] Thus, even if a household were asked to pay $1 per year for the service, the library would probably break even. It is not clear, however, that the library should charge for this service. It is attempting to spend its budget to maximize the library's benefit to the community, and this mailing service may well benefit the community more than $2000 spent on some other activity. But this is a decision that the library will have to make.

INFORMATION ON USING THE LIBRARY

Along with better information to the community concerning library services, the library could provide better information to its users on how to use the library.

[3] Using the postage rate for a nonprofit institution.

There are two kinds of problems. First, many patrons have difficulty in locating books. Forty-six respondents to the community survey thought that books could be made easier to find; a number indicated that they had difficulty using the Dewey Decimal System. Some respondents in the user survey also said that they found the Dewey Decimal System difficult to use, and one respondent found it hard to understand the arrangement of fiction (which is alphabetical by author). While it would be too costly to change classification schemes (since all existing books would have to be recataloged), a floor plan of the library, prominently displayed very near the entrance, could be of considerable assistance to many users. The floor plan should indicate the subject matter of books found in the different areas of the library.

Second, many patrons are unfamiliar with the library's special services. For example, 32 percent of those using the library did not know about the readers advisory service. (This is probably a conservative estimate, since nonrespondents are even less likely to know of its existence.) One solution is to include on the floor plan a statement that questions on the use of the library's collection should be referred to the readers advisor. This would not only alert the user to the existence of the readers advisor but would take some of the pressure off the front desk, where occasional queues form.

LIBRARY HOURS

A substantial number of persons would like the library to increase the number of hours it is open or to change its hours. The most common request was for the library to be open on Sunday afternoon. Sixty-one persons in the community survey and eight in the user survey asked for this change. (The users were not asked specifically about changes in hours, while the community was.) Forty-one respondents in the community survey and seven in the user survey asked for later hours in the evenings. There were a small number of requests for earlier hours.

To extend the hours requires a decision on allocation of library resources; however, it would seem worthwhile to make a short-term experiment to determine if usage increased significantly with Sunday hours. The library could simply count the number of users at various times during the week, with and without Sunday hours.[4] If total use rises, this would indicate that users were not merely substituting Sunday visits for weekday visits. However, even if total use did not rise, a relatively large number of Sunday patrons would indicate a preference to use the library on Sunday.

A similar experiment can be made for later evening hours. Since those requesting later hours were almost always students who were using the library to study, a decision to extend the evening hours should consider how many resources the library wishes to spend to perform a study-hall kind of function. Keeping track of the number of users at various times would also enable the library to pin-point those

[4] In the light of the findings of Chapter IV, the library might also want to determine whether those using the library during the additional hours were residents.

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hours when it is used the least, so that if total hours open were kept constant, the reallocation of hours could be made with the least difficulty.

THE PROBLEM OF BEST SELLERS

A problem that was not adequately dealt with in Chapter III is how many copies to buy of best sellers. One could, of course, apply the model of Chapter III to best sellers as a class; we have not done so because it would have been difficult to gather information on circulation of best sellers over time.

However, the problem may yield to theoretical reasoning. There are numerous complaints about not enough copies of best sellers. In the community survey, the most frequent complaint was that the library did not have a sufficient quantity of books; 194 respondents, or 20 percent of the total, wished the library to buy more books. Of the 194, 51 wanted the library to buy more best sellers; 10 persons in the user survey also responded (without being directly asked) that the library should buy more best sellers. The problem with best sellers is, of course, that initially they are in high demand but their circulation in later years is likely to be low, so that they must recover their purchase price in circulation benefits rather quickly.[5] In a best seller's early circulation period, however, the user-oriented rationale given in Chapter II for free circulation of books no longer applies; the bridge is no longer uncrowded. In such a situation, to permit one individual to borrow the book makes him better off, but it also makes someone else worse off, namely, another person who wanted the book. Under these conditions, a good case can be made for charging a rental fee for the book.[6] The resulting revenue could be used to purchase additional copies of best sellers, so that demand could be satisfied.

Such a policy would place the library in competition with rental libraries. However, we suspect that there are a number of patrons who use the library and do not use the rental library; for these persons the service would be a gain. Also, those who use both the public library and the rental library could be spared a trip to the rental library. There would be some additional administrative costs in keeping track of the number of days a best seller had circulated (if there were a daily charge) and in collecting fees, but these costs should not be large, and they could be included in the charge for the book. Of course, when demand falls to the point where it is unlikely that all copies will be demanded at once, the fee for checking out the book should be eliminated. This would require some monitoring, but could be accomplished as part of a computerized circulation system at very low cost. Alternatively, a fee could be charged for the use of all best sellers only for a certain period of time, say 6

[5] Recall that the circulation of Fiction, as a class, falls off rapidly. (It is among the most sensitive classes to the discount rate in Chapter III.) This would be even more likely in the case of additional copies of the same book.

[6] Economists who have studied library services have generally recommended charging a fee for library services (Tiebout and Willis 1965; Pfister and Milliman 1970). We have not chosen to investigate the question in relationship to this library.

months or 1 year, after acquisition, or for the period when there has been a circulation in, say, the past 3 months.

THE NOISE LEVEL IN THE LIBRARY

Forty-one respondents in the community survey asked that the library be kept quieter and seven respondents in the user survey complained of talking. The library attempts to keep the noise level down by employing a "monitor," who is responsible for maintaining order. Predictably, those who wished to talk complained about the monitor; eighteen respondents in the user survey made such complaints. All who complained about the monitor were students, generally in the seventh through ninth grades.[7] Traditionally, of course, the library has been an institution where silence reigns.[8] While respecting this tradition, one can still ask the question: To what extent should students' desires to talk be respected? One answer is that no one has the right to engage in conversation that disturbs others; that is, users have a right not to be disturbed. Given this accepted fact, there is the further question as to what effort the library can make to provide space where conversations can take place without disturbing others. The relevant questions thus become: What is the cost of providing "talking" areas? If such areas are provided, to what extent will they reduce noise in the "quiet" areas? We would not wish to speculate about the answers.

PARKING AND TRAFFIC

Although parking problems were not asked about in either survey, nineteen respondents in the community survey and six in the user survey made some comment about parking or heavy traffic. There were complaints about the high cost of parking and about the difficulty in finding space. Since lowering the price of parking would merely exacerbate the space problem, there seems to be no easy solution to the parking problem. The difficulty is that space in downtown Beverly Hills is expensive. There were some comments that the space given to city vehicles in the parking lot was frequently not used. The accuracy of this remark was not determined, but if true, there could be some reallocation of space that would make parking easier and also raise revenue for the city. Otherwise, the only certain solution appears to be that of building an above-ground parking garage; this, of course, would be desirable if demand were sufficiently great to support it. We have not tried to estimate the extent to which such a garage would be used, but it would not be difficult to determine at what percentage of its capacity the parking lot operates at various times during the day. This could be done by merely picking times

[7] With the exception of one respondent, whose student status could not be ascertained.

[8] For example, "I would now refer to the hard cover library, in which one is protected by columns and stones and heavy wooden paneling and heavy wooden bookcases and signs of 'QUIET'" (Glazer 1965).

at random and counting the number of empty stalls. If the lot seemed to be nearly full most of the time, the count could be extended to see how many cars entered the lot when it was full. Even this would not indicate the full extent of demand since the community survey showed that some households were discouraged from coming to the library at all because of parking difficulties. It might be noted that parking difficulties would be an added reason why households would favor a book-by-mail program.

Some respondents also suggested that a book drop be located on the street or in the parking lot. Due to the location of the fire station, the drop would probably have to be in the parking lot. This device would cut down on the parking problem for those who were merely returning books and should not be very expensive to operate or construct. For example, if it took a library page 15 minutes a day to empty the drop, the cost would be less than $200 per year plus the cost of construction.

Some respondents complained of the long walk from the parking lot to the front entrance. One pointed out that the cobblestones could become slippery if it rained; others liked the esthetics of the cobblestones. One solution is to change the entrance so that it faces the parking lot. We have not attempted to estimate the cost of making such a change, but, presumably, an architect could design a new entrance without too much difficulty. If the cost were not too great, the library should consider this possibility. It could be pointed out, however, that the amount of walking done by most individuals inside the library will equal that done to and from the parking lot. Another possibility is to install meters in the parking garage underneath the library, and move the city parking to the public lot; however, this would remove a staff perquisite. Moreover, if the lot were full, it would probably be inconvenient for arriving cars to get in and out of the facility.

MISSING BOOKS AND SECURITY SYSTEMS

In Chapter III we pointed out that 19 percent of the volumes and 17 percent of the titles in our sample were missing. (Missing means the books were gone without the library's knowledge.) Some of these books may have been misshelved; others may have been checked out at the time and not tagged as they came back into the library. There is some evidence from our user survey that the 19 percent figure is high; users found 82.6 percent of the *titles* that they sought. Books that were checked out could account for 11 percent of the remainder, so about 6 percent or 7 percent of the titles that the users were looking for were missing.[9] Of course, the titles sought by users

[9] The 11 percent figure is calculated by assuming that circulation throughout March is equally distributed so that the proportion of books checked out at any one point in time in March is:

$$\frac{\text{(March Circulation) (Average Number of Days a Book Is Kept).}}{\text{(Number of Books in Collection) (Number of Days in March)}}$$

March circulation was 31,754, and the average number of days that a book is kept is 12.943 in our sample of 2542 circulations. The number of books in the collection is estimated to be 120,000.

do not constitute a systematic sample of the library collection. Probably, however, the books that the users were seeking were among those more heavily demanded than the average book in the library.[10] Hence, an even higher percentage of the titles not found may have been checked out and an even smaller percentage missing.

It is difficult to appraise the benefits of various security measures. The analytical problem arises because the number of books missing at any point in time is what is observed, but security measures are designed to reduce the number of books that disappear in any particular period of time, that is, the rate of disappearance. In technical terms, we observe a stock variable, but are interested in a flow variable.

To be concrete, 19 percent of approximately 120,000 volumes are missing. The average price per volume in our sample was $4.41. (We make the assumption that books that disappear are priced at the average. Although it may seem more reasonable to assume that higher-priced books are more likely to disappear, the correlation between average price and the percent missing across the book classes defined in Chapter II is −0.2. Hence, the assumption that a missing book is priced at the average seems warranted.) Based on this calculation, $100,000 worth of books are missing. However, this is not a useful cost figure. What we need to know are the benefits and the costs of alternative ways of reducing the rate of loss. Security measures that can be employed include a guard to inspect parcels at the exit and various other security systems whose costs vary with the number of volumes to be covered.

To obtain some notion of the value of a guard, it is necessary to know the value of books that disappear in any given time period, and the reduction in disappearance that a guard would effect. The amount of money saved by the reduction in rate of loss can then be compared with the guard's salary. We have no data on the amount by which a guard reduces loss, but we can make some estimates on the value of books which disappear.

Table 3.1 shows that 20 percent of the books published in 1965 or earlier were missing and that 14 percent of the books published in 1966 or later were missing. These figures are compatible with a number of rates of disappearance. We make the following assumptions: (1) 2 percent of books less than 1 year old disappear; (2) 1 percent of books from 1 to 7 years old disappear; (3) books 8 years or older do not disappear; (4) books that are missing are discovered missing after 7 years. These assumptions are compatible with the percentages of books that we found to be missing. Although assumptions (3) and (4) are unrealistic (undoubtedly books of all ages disappear, and books of all vintages are continually found to be missing), they make for a simple analysis. At the price of complicating the analysis, we could modify these assumptions, but it is unlikely that our conclusions would change.

Based on these assumptions, about 1.4 percent of the book stock disappears each year. More to the point, 5 percent of the books published in 1966 or after disappeared and 3 percent of the books published in 1963-1965 disappeared in the most recent

[10] Twenty-eight percent of the books that the users sought were published after 1966, whereas only 20 percent of the collection was published after 1966. Since demand is higher for books published after 1966 (see Chapter III), the books sought were probably those in heavy demand.

year. Based on our circulation sample, there are (or were) approximately 23,000 books published after 1966 in the collection, and, at that rate of acquisition, there would be around 17,000 books in the collection published between 1963 and 1965. The average price of a book published in 1966 or later is $5.86; the average price of a book published before 1966 is $4.10. This latter figure probably understates the cost of replacing books published between 1963 and 1965, but we will use it.

Using these figures, $8800 worth of books disappear annually. This, however, is not the cost to the library of disappearing books. There are a number of other considerations. First, if the library orders a replacement, it must pay additional acquisition and cataloging costs. If these costs are approximately $2 per book, the cost of missing books rises to nearly $12,000.[11] However, if the library does not order a replacement, circulation benefits are lost, but it can be presumed that the value of these benefits is less than the price of the book.[12] That is, the book that disappeared may have been an older book, most of whose useful life had passed. For this reason, as well as several others, $12,000 is likely to be too high an estimate of the annual cost to the library of disappearing books. Some of the other reasons are: (1) Some books that were actually circulating may never have gotten into the sample and were thus counted as missing. There is some evidence for this in that the sample considerably underpredicts total circulation; and, when allowance is made for circulation, users reported a significantly lower percentage of books missing. In fact, users found only about one-third to one-half as many books missing. (2) Some of the books that are missing may be books which are charged out, but lost. For some of these books, the library is able to collect the price of the book from the borrower. (3) The $12,000 figure assumes that all books that are missing are replaced; if, in fact, books that are missing are not discovered missing until 7 years after they disappear, many books will not be replaced. Taking these factors into account, it would seem that the annual costs incurred by the library because of disappearing books are probably around $6000 to $8000, with $12,000 the upper limit.

These costs do not appear large enough to justify a guard. If a guard could be hired for $2.50 to $3.00 per hour, the cost of having a guard present for each hour that the library was open would be around $8000 to $9000 per year. Thus, even ignoring the inconvenience to users of having their parcels inspected, to be worthwhile the guard would have to completely eliminate disappearing books. Since we do not think this is likely, use of a guard does not seem warranted.

Another possibility is a mechanical security system. The one we have priced is the Tattle Tape system made by Minnesota Mining and Manufacturing. The monthly rental is $290, including a locking exit gate and a per book charge of 16 cents to 19 cents, depending on the number of books covered by the system. Suppose this system had been in effect from 1963 on. The annual rate of book acquisition was then around 6000, so if only new books had been processed through the system, the annual charge would have been $4620 plus the cost of any additional labor time to

[11] The $2 figure is substantially below the average cost figures for new books given in Chapter V, but acquisition and cataloging costs for a volume the library once had should be considerably lower.

[12] Or at least less than the price plus all the acquisition costs. This is true if the value of circulation benefits of the last book that the library is able to buy with its book budget equals the cost of the book.

operate the system. Thus, whether or not this system is worthwhile depends on how much it can reduce the loss rate. On this we have no information.

It would appear, however, that it would be worthwhile for the library to investigate other kinds of mechanical security systems. If the system were nearly 100 percent effective, and if additional labor time to encode the book and to sensitize and desensitize it were small, and if the system did not impose extra costs on users (such as detecting metal coins in their pockets and sounding an alarm), it would probably be worthwhile; if the rate of effectiveness were considerably less than 100 percent, the particular system priced would probably not be worthwhile. Moreover, if the system were adopted, it would probably not be worthwhile to convert the entire book collection to it unless the discount rate were quite low.[13] Suppose, for example, (1) there is a 0.5 percent annual chance that an older book costing $4.00 will disappear, (2) the book has a useful lifetime of 10 more years, (3) the book will be replaced if lost, and (4) the system prevents the loss; the expected saving, using a 10 percent discount rate, is 12 cents, which is below the cost of the strip needed to secure the book. These numbers, of course, are quite sensitive to all the assumptions made: The amount to be gained by including the book in the security system would be greater if the chance of disappearance were considerably greater, if the cost of replacement were considerably higher, if the expected life were longer, or if the discount rate were much lower.

THE LOAN PERIOD

Recently the Beverly Hills Library changed its loan period from 4 weeks to 2 weeks. In both the community survey and the user survey there were a number of complaints that 2 weeks were not long enough and that telephone renewals should be permitted. To obtain some insights into this problem, we have used our analysis of demand rates, discussed in Chapter III, to determine satisfied and unsatisfied demand under various loan periods. In Chapter III we estimated a request rate per 2-week period for each book. This request rate was the mean of a Poisson distribution. Using that distribution, it is possible to predict the number of satisfied requests and the number of unsatisfied requests each period. As explained in Chapter III, the number of satisfied requests is the probability of any particular number of requests times the number of requests up to the number of copies of the book; the number of unsatisfied requests is the probability of any number of requests that exceed the number of copies times the excess number of requests. We derive two formulas:

$$S = \sum_{i=1}^{N} i \cdot p(i), \qquad U = \sum_{i=N+1}^{\infty} p(i) \cdot (i - N) = R - S,$$

[13] A discount rate is necessary because installation of the system reduces future probability of theft, and the future benefits must be discounted.

where S and U are satisfied and unsatisfied requests respectively, N is the number of copies of the book, p(i) is the probability that the number of requests in a period equals i, and R is the total request rate. Using these formulas we have calculated the average number of satisfied and unsatisfied requests for 2-week loan periods, as shown in Table 7.1. At the end of the table, we see that in addition to the satisfied request rate of 0.0592, there is an unsatisfied request rate of 0.0286. (The satisfied request rates for each category are also shown in Table 3.5.) But, as was explained in Chapter III, the estimated satisfied request rates underpredict circulation in the sample, and circulation in the sample underpredicts actual circulation. This is probably due to underrepresentation of very popular books in our sample. Since the proportion of unsatisfied requests for very popular books is higher than average, we probably underestimate unsatisfied demand and hence underestimate the gain achieved by shortening the loan period. (See, for example, the extent of unsatisfied demands for Mysteries.) However, since the Poisson assumption also underpredicts circulation in the sample, it could be that the user's demands are eventually fulfilled.[14] In this case, the unsatisfied demand is overestimated, and the gain achieved by reducing the loan period is also overestimated. We shall assume that these biases roughly offset each other and that the ratio of satisfied to unsatisfied requests is approximately correct.

Under the present policy, about two-thirds of the requests are estimated to be satisfied and one-third are not. The figure varies considerably across classes, however; for a popular class, such as Mysteries published after 1966, less than 20 percent of the total requests are satisfied. For a not very popular class, such as Reference books that circulate, about 95 percent of the requests are satisfied.

To estimate what would happen if the circulation period were 3 weeks or 4 weeks, we have assumed that the time the book is kept shifts proportionately. For example, if the loan period is changed from 2 weeks to 4 weeks, all borrowers are assumed to keep their books twice as long. That this assumption may be approximately right is shown by the peak in the present distribution of checkout times at 14 days. Table 7.2 shows that 29.0 percent of circulations were exactly 14 days.

A change in the loan period is analytically the same as a change in the request rate; that is, since the distribution of requests (arrivals) is independent of time, on the average twice as many requests will occur in a 4-week period as in a 2-week period.[15] Thus, if we wish to analyze the effect of a 4-week loan period, we can study the effect of doubling the request rate in the 2-week loan period we observed. This will yield the same proportion of unsatisfied requests as lengthening the loan period. Increasing the request rate in a 2-week period increases both the satisfied and unsatisfied requests, with the unsatisfied requests increasing more than proportionately. Lengthening the loan period, however, does not change total requests; it only increases the proportion of unsatisfied requests. Thus, at the end of Table 7.1 we see that increasing the request rate 50 percent would lead to 0.0788 satisfied and 0.0524

[14] The total estimated request rate by class is close to the actual circulation rate.

[15] And since the Poisson distribution is additive, the resulting distribution is Poisson.

Table 7.1

SATISFIED AND UNSATISFIED REQUESTS WITH VARIOUS LOAN PERIODS

Class	Number of Titles	Two-Week Loan Period		Three-Week Loan Period		Four-Week Loan Period	
		Satisfied Requests	Unsatisfied Requests	Satisfied Requests	Unsatisfied Requests	Satisfied Requests	Unsatisfied Requests
Reference, circulating	10	.0187	.0011	.0273	.0024	.0354	.0041
Philosophy	9	.0604	.0076	.0855	.0165	.1076	.0283
Psychology							
Published before 1966	7	.1051	.0468	.1345	.0934	.1554	.1484
Published 1966 or after	4	.2061	.1906	.2324	.3626	.2394	.5535
Religion, except Judaism							
Published before 1966	10	.0855	.0133	.1191	.0291	.1475	.0501
Published 1966 or after	8	.0570	.0019	.0759	.0046	.0986	.0087
Judaism	3	.0126	.0005	.0185	.0011	.0242	.0020
Sociology, Economics, Political Science							
Published before 1966	66	.0248	.0028	.0354	.0061	.0448	.0105
Published 1966 or after	23	.0697	.0151	.0951	.0320	.1157	.0538
Education							
Published before 1966	5	.0358	.0054	.0501	.0718	.0623	.0202
Published 1966 or after	5	.1136	.0363	.1491	.0758	.1744	.1254
Linguistics							
Published before 1966	4	.1363	.0369	.1825	.0773	.2182	.1283
Published 1966 or after	3	.0126	.0005	.0185	.0011	.0242	.0020
Mathematics and Statistics	4	.1216	.0270	.1650	.0578	.1991	.0980
Physical Sciences	9	.0628	.0115	.0871	.0244	.1077	.0410
Life Sciences							
Published before 1966	18	.0490	.0093	.0678	.0196	.0838	.0328
Published 1966 or after	5	.1226	.0334	.1638	.0702	.1951	.1169
Engineering							
Published before 1966	12	.0339	.0027	.0490	.0059	.0629	.0104
Published 1966 or after	5	.0445	.0034	.0643	.0075	.0827	.0131
Medicine							
Published before 1966	8	.0905	.0218	.1221	.0463	.1465	.0780
Published 1966 or after	6	.1422	.0377	.1900	.0798	.2259	.1339
Cooking and Other Home Economics	7	.0797	.0173	.1088	.0365	.1326	.0612
Business Skills	10	.1089	.0393	.1429	.0793	.1687	.1276
Art Appreciation							
Published before 1966	22	.0466	.0086	.0644	.0184	.0793	.0311
Published 1966 or after	4	.1370	.0353	.1837	.0747	.2195	.1250
Horticulture and Gardening							
Published before 1966	3	.0251	.0010	.0370	.0022	.0483	.0039
Published 1966 or after	3	.0821	.0157	.1130	.0338	.1384	.0574
Architecture	8	.0328	.0017	.0480	.0038	.0624	.0067
Art Techniques and Interior Decoration	16	.0994	.0286	.1321	.0602	.1567	.0996
Music	27	.0424	.0066	.0596	.0140	.0747	.0234
Hobbies and Indoor Recreation	5	.0299	.0018	.0435	.0041	.0563	.0071
Athletics							
Published before 1966	6	.0608	.0068	.0865	.0149	.1095	.0257
Published 1966 or after	3	.1810	.0504	.2405	.1066	.2843	.1786
Entertainment	6	.0125	.0005	.0184	.0011	.0241	.0020
Literature and Rhetoric, not elsewhere classified							
Published before 1966	49	.0388	.0041	.0555	.0089	.0706	.0152
Published 1966 or after	7	.0467	.0056	.0662	.0123	.0835	.0212

Table 7.1--*continued*

Class	Number of Titles	Two-Week Loan Period		Three-Week Loan Period		Four-Week Loan Period	
		Satisfied Requests	Unsatisfied Requests	Satisfied Requests	Unsatisfied Requests	Satisfied Requests	Unsatisfied Requests
Poetry							
Published before 1966	19	.0304	.0042	.0428	.0090	.0537	.0153
Published 1966 or after	4	.0550	.0055	.0787	.0120	.1002	.0297
Drama							
Published before 1966	22	.0637	.0128	.0874	.0275	.1067	.0464
Published 1966 or after	5	.1866	.0957	.2291	.1943	.2513	.3132
Fiction, classified in the Dewey Decimal System							
Published before 1966	5	.0516	.0047	.0741	.0102	.0947	.0178
Published 1966 or after	4	.0964	.0194	.1324	.0414	.1619	.0698
Public Speaking	5	.0075	.0003	.0111	.0007	.0145	.0012
Geography and Travel							
Published before 1966	9	.0327	.0031	.0468	.0068	.0597	.0118
Published 1966 or after	8	.1174	.0366	.1553	.0758	.1838	.1244
Biography							
Published before 1966	80	.0354	.0055	.0500	.0114	.0633	.0186
Published 1966 or after	10	.0675	.0115	.0937	.0248	.1159	.0421
History							
Published before 1966	106	.0278	.0030	.0396	.0066	.0501	.0116
Published 1966 or after	18	.0671	.0209	.0887	.0432	.1048	.0711
General Fiction and Short Stories, not elsewhere classified							
Published before 1966	134	.0477	.0071	.0671	.0152	.0838	.0258
Published 1966 or after	38	.1172	.2043	.1281	.3489	.1335	.4817
Juvenile Fiction							
Published before 1966	52	.0548	.0099	.0763	.0208	.0949	.0326
Published 1966 or after	12	.0690	.0097	.0971	.0210	.1215	.0360
Juvenile Nonfiction							
Published before 1966	137	.0438	.0040	.0629	.0087	.0805	.0151
Published 1966 or after	32	.0744	.0127	.1035	.0271	.1283	.0459
Juvenile Teenage Fiction							
Published before 1966	8	.1184	.0562	.1482	.1136	.1664	.1827
Published 1966 or after	7	.0880	.0110	.1245	.0241	.1566	.0415
Preschool Fiction	19	.1155	.0473	.1470	.0973	.1670	.1588
Young Adult Nonfiction							
Published before 1966	18	.0710	.0122	.0987	.0261	.1222	.0442
Published 1966 or after	4	.1713	.1339	.1970	.2609	.2046	.4058
Young Adult Fiction	8	.1249	.1789	.1455	.3090	.1641	.4355
Westerns	4	.0448	.0068	.0626	.0147	.0779	.0252
Mysteries							
Published before 1966	12	.1480	.1088	.1755	.2096	.1895	.3238
Published 1966 or after	11	.2419	1.0308	.1983	1.6766	.1653	2.1978
Preschool Nonfiction							
Published before 1966	3	.0958	.0138	.1345	.0299	.1679	.0514
Published 1966 or after	8	.1478	.0219	.2068	.0479	.2565	.0830
Recordings	6	.0373	.0024	.0543	.0052	.0704	.0090
Overall	1208	.0592	.0286	.0788 .0525[a]	.0524 .0349[a]	.0952 .0476[a]	.0778 .0389[a]
Overall							
Published before 1966	975	.0480	--	--	--	--	--
Published 1966 or after	233	.1061	--	--	--	--	--

[a]Deflated to a 2-week basis.

Table 7.2

DISTRIBUTION OF CHECKOUT TIMES

Number of Days Kept Out	Percentage of Circulations
1	1.7
2	2.0
3	1.9
4	3.3
5	3.2
6	3.5
7	5.5
8	3.5
9	4.0
10	3.6
11	4.6
12	5.2
13	8.1
14	29.0
15	4.8
16	3.5
17	2.0
18	1.7
19	1.3
20	0.8
21	1.0
22	0.5
23	0.4
24	0.2
25	0.7
26	0.4
27	0.3
28	0.3
29	0.2
30	0.1
31	0.2
32	0.1
33	0.2
34	0.2
35	0.2
36	0.2
37	0.1
38	0.1
39	0.1
40	0
41	0.1
42	0.2
43-49	0
50 or more	0.7

unsatisfied requests per period. Since we are interested in what would happen using a 3-week period, we must deflate all numbers by one-third to compare the absolute numbers with the second and third columns. (We show the deflated figures for the all classes rates.) What is important, however, is the ratio of satisfied to unsatisfied requests. Unsatisfied requests have now risen to 40 percent of the total number of requests; changing to a 4-week period raises the percentage of unsatisfied requests to 45. One could, of course, also say that the percentage of satisfied requests fell from 67 percent to 60 percent to 55 percent with 2-, 3-, and 4-week loan periods, with no change in the total number of requests (by assumption).

Table 7.1 also shows the satisfied and unsatisfied requests by class; for the 3- and 4-week period we have not deflated to put the figures on a 2-week basis. But it is the ratio between satisfied and unsatisfied requests that is important. Thus, in a class such as Drama published after 1966, the proportion of unsatisfied requests is only about 33 percent with a 2-week loan period, but rises to 55 percent when the loan period changes to 4 weeks. Looking over the last two columns, we see that with a 4-week loan period, the number of unsatisfied requests approaches or exceeds the number of satisfied requests in a number of classes. Likewise, for a number of categories that are not heavily demanded, the proportion of unsatisfied requests is small even with a 4-week loan period. This suggests that the library might want to consider varying the loan periods for different books. For the most popular books, the loan period could be reduced to 7 days instead of (or in addition to) charging a rental fee.

Although the loan period was not asked about in either the user survey or the community survey, 12 persons in the user survey and 11 in the community survey complained about the change to a 2-week period. It is, of course, possible to want a longer loan period even if it means that one is less likely to find the books one wants. We can speculate on whether those who complained realized that the shorter loan period would lead to a greater availability of books (one individual did say that he liked the change because it provided greater availability); but even if they did, a decision on the length of a loan period involves weighing the relative merits of giving one individual a longer period of time to read a book against giving more individuals access to the book. The decision, however, is the library's to make.

If the library is constrained to keep the same loan period for all books, the above figures indicate that changing back to a 4-week loan period is likely to reduce circulation by about 20 percent; changing to a 3-week loan period will probably reduce it slightly more than 10 percent.[16] (These figures assume that the length of time books are kept is proportionate to the loan period.) It should also be remembered that the most frequent complaint in the community survey was that the library did not have an adequate number of books; lengthening the loan period would exacerbate this problem.

[16] Thus, much of the recent increase in circulation at the library is likely to be due to the change in loan period. If this is so, future growth will not continue at past rates.

A CONCLUDING REMARK

Since major findings of the study are given in the Summary at the beginning of the report, we will not recapitulate them here. However, lest the tone of this report sound overly critical, we should add that the plurality of individuals in our surveys seemed quite satisfied with library service. One-third of the respondents to the community survey indicated that they had no suggestions for improvement—service was good. In addition, 16 individuals in the community survey and 78 in the user survey included a comment indicating that they were quite pleased with their library.

APPENDIX A

THE USER SURVEY

FOR A 2-HOUR PERIOD on seven different days in March 1971, all persons entering the Beverly Hills Library were asked to fill out a survey questionnaire designed to show which books and periodicals they consulted while in the library, as well as certain social and demographic characteristics. A slightly different questionnaire was prepared for adult users than for users of the children's library. The questionnaires, together with some summary information about the library users, are reproduced at the end of this appendix. The dates, times, number of questionnaires handed out, the number of questionnaires returned are shown in Table A.1. The estimates were made from guesses at the number of questionnaires handed out; however, in most cases we knew approximately how many were distributed, so the error is unlikely to exceed 15 percent. An estimated 53.4 percent of those using the adult library filled out a questionnaire, and 71.3 percent of those using the children's library. The last few days of the user survey, a number of persons claimed that they had already filled out the questionnaire, and did not want to fill it out again. This could account for the apparent falloff in the response rate in the adult library. Unfortunately, the questionnaire was not designed to show whether the respondent had filled out a questionnaire previously. Although this poses no problem for the book-selection model, it does create some unknown biases in the estimates of user characteristics, which are presented in Chapter IV.

As part of the user survey, we also gathered information on periodicals consulted in the library. We have not tried to bring periodical or audio-visual material into the book-selection model, although, conceptually, we could have created a newspaper class, a magazine class, and so forth. A listing of the newspapers, magazines, and miscellaneous business investor services publications consulted during the user survey is given in Table A.3.

Table A.1

NUMBER OF QUESTIONNAIRES DISTRIBUTED AND RETURNED, MARCH 5-22, 1971

Date and Time	Adult Questionnaires		Children's Questionnaires	
	Handed Out	Returned	Handed Out	Returned
Friday, March 5, 10 a.m. (opening time) to Noon	75 (est.)	51	--	--
Monday, March 15, 7 p.m.-9 p.m. (closing time)	122 (est.)[a]	85	35 (est.)[b]	30
Tuesday, March 16, 5 p.m.-7 p.m.	150	82	23 (est.)	11
Thursday, March 18, 10 a.m.-Noon	94	43	5	4
Friday, March 19, 3 p.m.-5 p.m.	119	52	36 (est.)	25
Saturday, March 20, 2 p.m.-4 p.m.	143 (est.)	89	21	16
Monday, March 22, 7 p.m.-9 p.m.	197	76	30	21
Unknown		3		
Total	900	481	150	107

[a]Eighty-seven persons entered the adult library after 7:35 p.m.

[b]Twenty-four persons entered the children's library after 7:35 p.m.

Table A.2

DISTRIBUTION OF BOOKS CHECKED OUT AND BOOKS USED IN LIBRARY IN MARCH SURVEY[a]

Class	Percentage of Books Checked Out	Percentage of Books Used in Library
Reference, circulating		
Published before 1966	0.0	0.8
Published 1966 or after	0.0	1.1
Reference, noncirculating		
Published before 1966	0.0	10.0
Published 1966 or after	0.0	12.3
Philosophy		
Published before 1966	0.2	0.4
Published 1966 or after	2.1	2.3
Religion		
Published before 1966	0.2	0.4
Published 1966 or after	2.3	1.9
Judaism		
Published 1966 or after	0.2	0.4
Sociology, Economics, Political Science		
Published before 1966	3.6	1.1
Published 1966 or after	7.8	5.4
Education		
Published before 1966	0.8	0.0
Published 1966 or after	0.9	0.8
Linguistics		
Published before 1966	0.2	0.0
Published 1966 or after	0.4	1.1
Mathematics		
Published 1966 or after	0.0	0.4
Physical Sciences		
Published 1966 or after	0.6	0.0
Life Sciences		
Published before 1966	0.6	1.1
Published 1966 or after	2.1	2.7
Engineering		
Published before 1966	0.4	0.0
Published 1966 or after	1.9	3.1
Medicine		
Published before 1966	0.4	0.0
Published 1966 or after	1.3	0.8
Animal Care		
Published before 1966	0.4	0.0
Published 1966 or after	0.9	1.1
Hobbies		
Published before 1966	0.0	0.0
Published 1966 or after	0.8	0.4
Cooking		
Published 1966 or after	0.8	0.0
Other Home Economics		
Published 1966 or after	0.4	0.0
Business Skills		
Published before 1966	0.8	0.4
Published 1966 or after	1.5	5.0
Horticulture and Gardening		
Published before 1966	0.2	0.0
Published 1966 or after	0.2	0.0
Architecture		
Published 1966 or after	0.0	0.0
Art Techniques and Interior Decoration		
Published 1966 or after	1.9	0.0
Music		
Published 1966 or after	1.1	1.9

Table A.2--*continued*

Class	Percentage of Books Checked Out	Percentage of Books Used in Library
Athletics		
Published before 1966	0.4	0.0
Published 1966 or after	0.6	0.8
Entertainment		
Published before 1966	0.6	0.4
Published 1966 or after	1.3	1.9
Poetry		
Published before 1966	0.4	0.4
Published 1966 or after	0.8	0.8
Drama		
Published before 1966	1.1	0.4
Published 1966 or after	2.1	1.5
Fiction, classified in the Dewey Decimal System		
Published 1966 or after	1.3	0.8
Geography and Travel		
Published before 1966	0.8	1.5
Published 1966 or after	0.6	1.9
Biography		
Published before 1966	0.4	0.8
Published 1966 or after	1.7	4.6
History		
Published before 1966	2.3	2.3
Published 1966 or after	5.9	5.4
General Fiction and Short Stories, not elsewhere classified		
Published before 1966	7.8	1.1
Published 1966 or after	11.8	8.0
Juvenile Fiction		
Published before 1966	2.7	3.8
Published 1966 or after	8.2	3.1
Juvenile Nonfiction		
Published before 1966	1.3	0.4
Published 1966 or after	4.9	2.3
Juvenile Teenage Fiction		
Published before 1966	0.2	0.4
Published 1966 or after	0.6	0.8
Young Adult Fiction		
Published before 1966	0.2	0.0
Published 1966 or after	0.2	0.0
Young Adult Nonfiction		
Published before 1966	0.2	0.0
Published 1966 or after	1.1	0.0
Preschool Fiction		
Published before 1966	0.6	0.0
Published 1966 or after	0.4	0.0
Preschool Nonfiction		
Published before 1966	0.0	0.0
Published 1966 or after	0.4	0.0
Mysteries		
Published before 1966	1.5	0.4
Published 1966 or after	1.3	1.5
Science Fiction		
Published before 1966	0.9	0.0
Published 1966 or after	0.9	0.0

[a]This table gives an additional disaggregation of the books included in Table 3.7, using the classes from Table 3.1.

Table A.3

NEWSPAPERS, MAGAZINES, AND MISCELLANEOUS PUBLICATIONS CONSULTED DURNG USER SURVEY

		Number of Readers in Sample[a]
Newspapers		
1.	Wall Street Journal	24
2.	New York Times	16
3.	Los Angeles Times	13
4.	Manchester Guardian	5
5.	Los Angeles Herald-Examiner	4
6.	Christian Science Monitor	3
7.	Variety	3
8.	Chicago Tribune	3
9.	London Times	2
10.	St. Louis Post-Dispatch	2
11.	Sacramento Bee	1
12.	Denver Post	1
13.	Beverly Hills Independent	1
14.	Corriere della Sera	1
15.	La Stampa	1
16.	Beverly Hills Courier	1
17.	Jerusalem Post	1
18.	National Observer	1
19.	Unspecified	5
20.	Tidings (sought)	1
Magazines		
1.	Time	12
2.	Newsweek	12
3.	Life	7
4.	Nation	6
5.	Psychology Today	6
6.	Ramparts	6
7.	Vogue	5
8.	U.S. News and World Report	5
9.	Der Spiegel	5
10.	House and Garden	5
11.	Look	5
12.	Sports Illustrated	5
13.	National Geographic	5
14.	Commentary	5
15.	Esquire	4
16.	Business Week	4
17.	Billboard	4
18.	Broadcasting	4
19.	Harpers	4
20.	Scientific American	4
21.	Co-Ed	4
22.	Highlights	4

[a]These numbers are based on 482 adult replies and 107 replies from children.

Table A.3--*continued*

	Number of Readers in Sample
Magazines (continued)	
23. Fortune	4
24. Reader's Digest	3
25. California Business	3
26. Saturday Review	3
27. House Beautiful	3
28. Changing Times	3
29. Consumer Reports	3
30. Consumer Bulletin	3
31. American Heritage	3
32. Seventeen	3
33. National Review	2
34. The Writer	2
35. Administrative Management	2
36. World Tennis	2
37. New Yorker	2
38. Harpers Bazaar	2
39. Gourmet	2
40. Atlantic	2
41. Paris-Match	2
42. Vital Speeches	2
43. Aviation Week	2
44. Christian Century	2
45. Electronics World	2
46. Art Forum	2
47. New Republic	2
48. Child Life	2
49. Popular Science	2
50. American West	1
51. Hollywood Reporter	1
52. Volunteer	1
53. Travel	1
54. Westways	1
55. Smithsonian	1
56. Japan Illustrated	1
57. Atlas	1
58. Road Test	1
59. Holiday	1
60. American Scholar	1
61. The Economist	1
62. Today's Health	1
63. Better Homes and Gardens	1
64. Art in America	1
65. Road and Track	1
66. Rolling Stone (sought)	1
67. Literary Digest	1
68. Drama	1
69. Review of Reviews	1
70. Nation's Business	1
71. New York Times Magazine	1
72. Sky and Telescope	1
73. Antiques	1
74. Poetry	1

Table A.3--*continued*

		Number of Readers in Sample
Magazines (continued)		
75.	Dance Magazine	1
76.	Town and Country	1
77.	Senior Scholastic	1
78.	Hi Fidelity	1
79.	Farm Journal	1
80.	New York Review of Books	1
81.	Architectural Record	1
82.	Sea	1
83.	Yachting	1
84.	Oceans	1
85.	South African Panorama	1
86.	Réalités	1
87.	Federal Reserve Bulletin	1
88.	Current Biography	1
89.	Standard Rate and Data	1
90.	Television Rate Book	1
91.	Popular Photography	1
92.	Modern Photography	1
93.	Camera 35 (sought)	1
94.	National Wildlife	1
95.	Parents	1
96.	American Home	1
97.	Ladies Home Journal	1
98.	Catholic World	1
99.	Progressive Architecture	1
100.	UNESCO Courier	1
101.	Current	1
102.	Index to the Readers Guide	1
103.	Etude	1
104.	Journal of Broadcasting	1
105.	Electronic Magazine	1
106.	Apollo	1
107.	Commonweal	1
108.	Foreign Affairs	1
109.	America	1
110.	European	1
111.	McCalls	1
112.	The New Nation	1
113.	New York	1
114.	Redbook	1
115.	Encounter	1
116.	Plays	1
117.	Teen	1
118.	Boy's Life	1
119.	New Masses	1
120.	Unspecified	7
Business or Investor Services Publications		
1.	Moody's Industrials	8
2.	Barrons	8
3.	Forbes	5

Table A.3--*continued*

	Number of Readers in Sample
Business or Investor Services Publications--*cont.*	
4. Value Line	4
5. Financial World	4
6. Standard and Poors	4
7. Moody's Stock Survey	4
8. Dun's	3
9. Wall Street Transcript	3
10. Kiplinger Letter	3
11. Telephone books	2
12. Federal Tax Guide	2
13. Dun and Bradstreet's Million Dollar Corporations	1
14. Jane's Major Companies of Europe	1
15. Walkers Newsletter	1
16. Moody's Industrial News Reports	1
17. Moody's Handbook of Common Stocks	1
18. Business Conditions Digest	1
19. Best Insurance	1
20. Student Employment Guides	1
21. Advertising Agency Directories	1
22. Moody's Bond Survey	1
23. First National City Bank Monthly Economic Letter	1
24. Investment	1
25. Kiplinger Tax Report	1
26. Dun and Bradstreet's Corporate Managements	1
27. Unspecified	2

Date:_____

Time entered:_____ Time Departed:_____

SURVEY OF ADULT USERS:

The Beverly Hills Public Library is asking some questions of its users to improve its service to them. To help the Library in determining what kinds of books and magazines to purchase, it is important to know how much various parts of the collection are used. We are particularly interested in knowing what kind of reading material you use in the library but do not check out. We hope you will assist us by filling out the following questionnaire.

In the questionnaire you are asked to write down the catalog numbers of all the books you look for, and answer some questions regarding these books. It will probably be simplest to do this when you look for the book. If you have questions about the questionnaire, please ask the person who gave you this form. Please hand the questionnaire in as you leave the library, noting the time in the upper right hand corner. Thank you very much for cooperating.

June E. Bayless

June E. Bayless
City Librarian

I.

1. PLEASE LIST ALL THE BOOKS YOU TOOK OFF THE SHELF OR TRIED TO FIND DURING YOUR STAY IN THE LIBRARY, AND ANSWER THE 6 QUESTIONS ASKED FOR EACH BOOK BY CHECKING THE APPROPRIATE COLUMN. PLEASE LIST ONE BOOK PER LINE.

CATALOG NUMBER OR LETTER (Number or letter on outside of book - such as 759.4 or SF). If there is no number or letter, write F for fiction. (If the library does not own the book, give author and title.)	Does the Library own the book?		Did you find the book on the shelf?		Did you try to find this book by using the card catalog?		Will you check out the book?		Do you think you would have bought this book if the library did not (or does not) own it?			Date of publication (listed on title page or page immediately following.
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Maybe	No	

2. IF YOU LOOKED AT ANY NEWSPAPERS, MAGAZINES, OR INVESTOR SERVICES (SUCH AS STANDARD AND POORS) WHILE YOU WERE IN THE LIBRARY, PLEASE LIST THEM BELOW:

NEWSPAPERS	MAGAZINES	BUSINESS OR INVESTOR SERVICES

TO ANSWER THESE QUESTIONS, PLEASE CIRCLE THE NUMBER OF YOUR ANSWER

3. Did you use the Readers' Advisory Service while you were in the library today?

   1. Yes
   2. No (IF NO, SKIP TO Q. 5)

4. Would you say the Readers' Advisory Service personnel were helpful or not? (SKIP TO QUESTION 6 AFTER ANSWERING)

   1. Yes
   2. No

5. Do you know about the Readers' Advisory Service?

   1. Yes
   2. No

6. Did you use the Reference Service while you were in the library today?

   1. Yes
   2. No (IF NO, SKIP TO Q. 8)

7. Would you say the Reference Service personnel were helpful or not?

   1. Yes
   2. No

8. Did you bring any materials into the library to study or read?

   1. Yes
   2. No

II. We are also trying to gather information on the kind of person we serve. The following questions are asked for that purpose. Please circle the number of your answer.

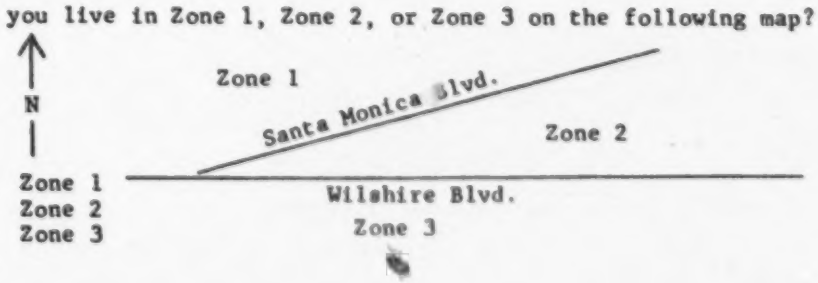
1. About how often do you come into the library?

   1. Five times a week or more
   2. Three or four times a week
   3. Around twice a week
   4. Around once a week
   5. Around twice a month
   6. Around once a month
   7. Three to six times per year
   8. Less frequently than three times per year

2. Are you a resident of Beverly Hills?

   1. Yes
   2. No (IF NO, SKIP TO Q. 4)

3. Do you live in Zone 1, Zone 2, or Zone 3 on the following map?



   1. Zone 1
   2. Zone 2
   3. Zone 3

4. Are you employed?

   1. Yes
   2. No (IF NO, SKIP TO QUESTION 6)

5. Are you employed in Beverly Hills?

   1. Yes
   2. No

6. What is your sex?

   1. Male
   2. Female

7. What is your age?

   1. Under 25
   2. 25-39
   3. 40-64
   4. 65 and over

8. Are you married?

   1. Yes
   2. No

9. What brought you into the library today?

   1. To obtain material for leisure reading
   2. School assignment
   3. Job assignment
   4. Lecture or Class at Library
   5. Film or Music Program at Library
   6. Other (Please specify)

10. Did you know that if the Beverly Hills Library does not have a book, you could request the librarian to borrow it from another library through interlibrary loan?

    1. Yes
    2. No

11. Do you have a Beverly Hills Library card?

    1. Yes
    2. No

12. What is the highest grade in school which you have completed? (If currently a student, please indicate present level)

    01. 6th grade or less
    02. 7th-8th grade
    03. 9th grade
    04. 10th-12th grade
    05. 1 year college
    06. 2 years college
    07. 3 years college
    08. 4 years college or Bachelor's degree
    09. Work beyond Bachelor's degree, but no graduate degree
    10. Bachelor's degree and graduate degree

13. Are you currently a full-time student?

    1. Yes
    2. No (IF NO, SKIP TO QUESTION 20)

14. Do you attend school in Beverly Hills?

    1. Yes
    2. No

15. Are you using the adult library for a school assignment?

    1. Yes
    2. No (IF NO, SKIP TO QUESTION 17)

16. If so, is this because:

    1. The school library does not own the material I need.
    2. The school library owns the material I need, but it is unavailable to me there.
    3. Although the material is available at the school library, I'd rather use the Public Library.

PLEASE ANSWER QUESTIONS 17, 18, and 19 IF YOU ARE CURRENTLY A STUDENT IN THE 7TH, 8TH, OR 9TH GRADES.

17. About what proportion of the times that you come into the library do you use the adult collection?

    1. Almost always
    2. About three-fourths of the time
    3. About half the time
    4. About one-quarter of the time
    5. Very seldom

18. Do you have difficulty finding books you'd like to read in the adult library?

    1. Yes
    2. No

19. Does the children's library have books you like to read?

    1. Yes, many
    2. Yes, a few
    3. No.

20. Are there any ways in which the Library might improve its service to you?

Date:_____

Time entered:_____ Time Departed:_____

SURVEY OF THE USERS OF THE CHILDREN'S LIBRARY

The Beverly Hills Public Library is asking some questions of its users to improve its service to them. To help the Library in determining what kinds of books and magazines to purchase, it is important to know how much various parts of the collection are used. We are particularly interested in knowing what kind of reading material you use in the library but do not check out. We hope you will assist us by filling out the following questionnaire.

In the questionnaire you are asked to write down the catalog numbers of all the books you look for and answer some questions regarding these books. It will probably be simplest to do this when you look for the book. If you have questions about the questionnaire, please ask the person who gave you this form. Please hand the questionnaire in as you leave the library, noting the time in the upper right hand corner. Thank you very much for cooperating.

June E. Bayless

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City Librarian

1.17

I.

1. PLEASE LIST ALL THE BOOKS YOU TOOK OFF THE SHELF OR TRIED TO FIND DURING YOUR STAY IN THE LIBRARY, AND ANSWER THE 6 QUESTIONS ASKED FOR EACH BOOK BY CHECKING THE APPROPRIATE COLUMN. PLEASE LIST ONE BOOK PER LINE.

CATALOG NUMBER OR LETTER (Number or letter on outside of book - such as 759.4 or SF). If there is no number or letter, write F for fiction. (If the library does not own the book, give author and title.)	Does the Library own the book?		Did you find the book on the shelf?		Did you try to find this book by using the card catalog?		Will you check out the book?		Do you think you would have bought this book if the library did not (or does not) own it?			Date of publication (listed on title page or page immediately following.
	Yes	No	Yes	No	Yes	No	Yes	No	Yes	Maybe	No	

2. IF YOU LOOKED AT ANY NEWSPAPERS OR MAGAZINES WHILE YOU WERE IN THE LIBRARY, PLEASE LIST THEM BELOW:

NEWSPAPERS	MAGAZINES

128

TO ANSWER THESE QUESTIONS, PLEASE CIRCLE THE NUMBER OF YOUR ANSWER

3. Did you come into the library with one or both of your parents?

   1. Yes
   2. No

4. Did you ask the children's librarian any questions?

   1. Yes
   2. No (IF NO, SKIP TO QUESTION 6)

5. Was she helpful or not?

   1. Yes
   2. No

6. Did you attend any function of the library, such as the story hour, on this visit? Name of function attended:

   1. Story hour
   2. Film
   3. Lecture
   4. Other (specify)_____

7. How often do you come into the library?

   1. Five times a week or more
   2. Three or four times a week
   3. About twice a week
   4. About once a week
   5. About twice a month
   6. About once a month
   7. Less than once a month

8. What is your age?

   1. 6 years or under
   2. 7 years
   3. 8 years
   4. 9 years
   5. 10 years
   6. 11 years
   7. 12 years
   8. 13 years
   9. 14 years or over

9. Do you live in Beverly Hills?

   1. Yes
   2. No

10. Do you have a card for the Beverly Hills Library?

    1. Yes
    2. No

11. Do you attend a school in Beverly Hills?

    1. Yes
    2. No

12. Are you using the Public Library for a school assignment?

    1. Yes
    2. No (IF NO, SKIP TO QUESTION 14)

13. If so, is this because:

    1. The school library did not own books or other materials you wanted to use (TYPE OF MATERIAL:_____)
    2. The school library owned material you wanted to use, but it wasn't available (TYPE OF MATERIAL:_____)
    3. Other reason (Please specify:_____)

PLEASE ANSWER QUESTIONS 14, 15 AND 16 IF YOU ARE IN THE 7TH OR 8TH GRADES

14. Do you ever use the adult library?

    1. Yes
    2. No (IF NO, SKIP TO QUESTION 17)

15. About what proportion of the time that you come in the library do you use the adult library?

    1. Almost never
    2. About one-fourth
    3. About one-half
    4. About three-quarters
    5. About always

16. Why do you use the adult collection?

    1. Boys and girls books are too easy.
    2. There aren't enough books in the children's library.
    3. The material I want cannot be checked out of the library.
    4. Other (Please specify_____)

17. Could the Public Library do anything to improve its service to you?

SUMMARY INFORMATION ON THE CHARACTERISTICS OF THE USERS OF THE BEVERLY HILLS LIBRARY

The Users of the Adult Library:

1. Are you a resident of Beverly Hills?

Yes - 270	62.1%
No - 165	37.9%
Missing - 47	

2. Where do you live? (if a Beverly Hills resident)

North of Santa Monica Blvd.	79	30.4%	(30.3%)*
Between Santa Monica and Wilshire Blvds.	74	28.5%	(22.2%)*
South of Wilshire Blvd.	107	41.2%	(47.5%)*
Missing	10		

3. Are you employed?

Yes - 220	54.3%
No - 185	45.7%
Missing - 10	

4. Are you employed in Beverly Hills? (if employed)

Yes - 87	40.1%
No - 130	59.9%
Missing - 3	

5. What is your sex?

Male - 265	57.7%
Female - 194	42.3%
Missing - 23	

6. Are you married?

Yes - 168	36.4%
No - 293	63.0%
Missing - 21	

7. Do you hold a library card?

Yes - 358	77.7%
No - 103	22.3%
Missing - 21	

8. Are you a student?

Yes - 204	46.6%
No - 235	53.4%
Missing - 44	

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*The figures in parentheses are the proportion of the Beverly Hills population living in each area.

9. Are you a student in Beverly Hills? (if a student)

Yes - 80	39.2%
No - 124	60.8%

10. Are you using the library for a school assignment? (if a student)

Yes - 131	67.5%
No - 63	32.5%
Missing - 10	

Questions 11, 12, and 13 were asked of 7th, 8th, and 9th graders:

11. About what proportion of the time that you come into the library do you use the adult collection?

Almost always - 25	75.8%
3/4 of the time - 4	12.1%
1/2 of the time - 2	6.1%
1/4 of the time - 0	0
Very seldom - 2	6.1%
Missing - 4	

12. Do you have difficulty finding books you'd like to read in the adult library?

Yes - 6	14.4%
No - 25	80.6%
Missing - 6	

13. Does the children's library have books you like to read?

Yes, many - 22	6.3%
Yes, a few - 12	37.5%
No - 18	56.3%
Missing - 5	

Users of the Children's Library:

1. Did you come with your parents?

Yes - 31	35.2%
No - 57	64.8%
Missing - 19	

2. What is your age?

6 or less	0	
7	2	2.2%
8	5	5.5%
9	10	11.0%
10	8	8.8%
11	20	22.0%
12	15	16.5%
13	13	14.3%
14 + (including adults)	18	19.8%
Missing	16	

3. Are you a resident of Beverly Hills?

Yes - 83	90.2%
No - 9	9.8%
Missing - 15	

4. Do you have a library card?

Yes - 84	91.3%
No - 8	8.7%
Missing - 15	

5. Do you attend school in Beverly Hills?

Yes - 76	78.4%
No - 21	21.6%
Missing - 10	

6. Are you using the library for a school assignment?

Yes - 53	58.9%
No - 37	41.1%
Missing - 17	

7. Why are you using the Public Library for a school assignment?

The material is not owned by the school library	15	35.7%
The material is owned but not available	8	19.0%
Other	16	38.1%
Combination of first and second reasons	3	7.1%
Missing	11	

Questions 8, 9, and 10 were asked of 7th and 8th graders:

8. Do you ever use the adult library?

Yes - 52	80%
No - 13	20%

9. How frequently do you use the adult library, if you do use it?

Almost always - 13	25.0%
3/4 of the time - 15	28.8%
1/2 of the time - 7	13.5%
1/4 of the time - 6	11.5%
Almost never - 11	21.2%
Missing - 0	

10. Why do you use the adult collection?

Boys and girls books are too easy	7	13.7%
There aren't enough books in the children's library	15	29.4%
The material I want cannot be checked out of the library	2	3.9%
Other	19	37.3%
First and second reasons	3	5.9%
Second and third reasons	2	3.9%
First and fourth reasons	1	2.0%
First, second, and third reasons	2	3.9%
Missing	0	

APPENDIX B

THE COMMUNITY SURVEY

THE MECHANICS OF THE COMMUNITY SURVEY

In November 1970 a questionnaire was mailed to 10 percent of the registered voters of Beverly Hills. The registered voter list was used because it was the most comprehensive population list from which to sample.[1] At the time of the survey, there were 21,760 registered voters in Beverly Hills, and the 1970 Census shows that the city's population over age 21 was approximately 25,826. (The 25,826 figure was computed by estimating that there were 26,161 individuals 20 and over in Beverly Hills and subtracting one-fifth of the number in the 20-24 bracket.) Thus, the proportion of the population that was registered to vote is estimated to be 84.3 percent.

The questionnaires sent out numbered 2176; of these, 83 were returned by the Post Office because the addressee had moved, died, or could not be located. This means that 2093 were delivered to the addresses listed. Out of this number, 1252 were returned, so that the response rate was 59.8 percent. Within 3 weeks of the original mailing, 816, or 39 percent, had been returned. At the end of the 3-week period, a follow-up questionnaire was mailed; 436 additional households, or 20.8 percent, responded to the follow-up.

NOTES ON THE ECONOMETRIC TECHNIQUE USED TO DERIVE TABLE 4.7

The equations specified in Table 4.7 were, with one exception, estimated by ordinary least squares. The specification is recursive; cardholding is a function of

[1] Carnovsky (1967) also used a voter registration list as a base for a community survey.

use, but use is not a function of cardholding. That is, those who expect to use the library obtain a card, but the mere act of obtaining a card does not influence one's use of the library. While we feel that this specification is the most reasonable one, we could have, alternatively, made use and cardholding functions of each other; unfortunately, the coefficients for use and cardholding can not be identified without excluding an exogenous variable from each equation. Since we feel that theory is not powerful enough to sustain such an exclusion, we have used the recursive formulation.

The recursive formulation can be biased if there is a correlation between the error terms of the two equations (Fisher 1966). Such a correlation is likely to exist because of a "household" effect; households who use the library more (or less) intensively than predicted are also likely to be more (or less) likely to hold a card. If so, the coefficient of use in the cardholding equation will be biased upwards. One method for correcting this bias is to use instrumental variables; that is, use of the library is regressed upon a number of exogenous variables and the predicted values for use become the explanatory variables in the cardholder equation rather than the actual values. The general idea is to purge the explanatory variable of the stochastic component that is associated with the error term in the cardholding equation (because of the "household" effect). This procedure was employed, and the following instrument was used (standard errors in parentheses):

$$\begin{aligned}\text{Use} = {} & 41.20 + 10.66 \text{ Desirous of More Books} \\ & \quad (2.06) \\ & - 8.98 \text{ Did Not Know About Art Collection} \\ & \quad (2.12) \\ & - 4.94 \text{ Not Interested in Film Program} \\ & \quad (1.52) \\ & + 7.42 \text{ Wanted Change in Hours} \\ & \quad (2.59)\end{aligned}$$

The results of employing the predicted values of use from this regression in the cardholding regression are shown in the second row of Table 4.7. As can be seen, the coefficients are relatively stable except for the coefficient of the use variable, which goes up, not down. Because the correction was not in the expected direction, this equation was not used.

RESPONSES TO THE COMMUNITY SURVEY

1. Do you have a library card for the Beverly Hills Public Library?

7 707 Yes (SKIP TO QUESTION 3) 527 No

2. Did you ever have a Beverly Hills Public Library card?

8 231 Yes 357 No

3. Do any other members of your household now have a Beverly Hills library card? (CHECK AS MANY AS APPLY)

9 585 No 311 Yes — Spouse 458 Yes — Children

4. Has anyone in your household ever used the Beverly Hills Public Library? (Include such things as telephoned questions and trips to the library for any purpose.)

12 983 Yes (SKIP TO QUESTION 6) 275 No

5. Are there any particular reasons why members of your household haven't used the Beverly Hills Public Library? (CHECK AS MANY AS APPLY AND SKIP TO QUESTION 8)

13 13 Don't know where the library is

18 Library is too far away from my home

11 Library hours are inconvenient: What would be better? _____

72 Don't have time to read books

218 Buy books and magazines to read

50 Use another library: Please indicate which library: _____

112 Just haven't gotten around to getting a library card

61 Other: Please explain _____

155 No particular reason

6. Thinking about the person in your household who used the Beverly Hills Library *most* frequently, about how frequently would you say this is? (CHECK ONE AND INCLUDE ALL USES)

22 54 About twice a week or more frequently 258 Three to six times a year

145 About once a week 111 Once or twice a year

353 One to three times a month 62 Less than once a year

7. Could the library do anything to improve its service to you or members of your household? (CHECK AS MANY AS APPLY. PLEASE EXPLAIN YOUR ANSWERS, IF NECESSARY. THIS WILL HELP US MAKE CHANGES)

23 279 Don't know—do not use library (SKIP TO QUESTION 8)

194 Buy more books: What kind would you like: _____

46 Make books easier to find: Explain: _____

55 Improve reference service: Explain: _____

110 Change library hours: What would be convenient for you? _____

41 Keep the library quieter

22 Improve seating: Explain: _____

28 Buy more foreign language books: What language: _____

34 Buy more large print books for limited vision users

59 Buy more records: What kind would you like? _____

59 Other (Please feel free to attach explanatory comments)

325 Nothing, service is good

8. Are you interested in attending the Beverly Hills Public Library's special program of films?

35 596 Yes 519 No (SKIP TO QUESTION 10)

9. What time would be most preferable for you? (CHECK ONE)

36 48 Mornings 115 Afternoons 454 Evenings

10. Do you know about the special collection of books on late 19th and 20th century art which the Friends of the Library are building?

37 172 Yes 991 No

11. Would you participate in the following "borrow-by-mail" program: For $3 per year the library would send you every month a list of its newly acquired books. If you wished to borrow a book on the list, you could phone the library and they would send you a copy of the book by mail as soon as the book is available. The book could be returned by mail or through the night depository if it is inconvenient to return the book when the library is open. (CHECK ONE)

38 531 Yes. I would participate 370 No, I am uninterested 289 Not sure

QUESTIONS 12-26 ARE DESIGNED TO GIVE GENERAL BACKGROUND INFORMATION TO HELP US IN INTERPRETING RESPONSES TO THE SURVEY.

12. During the past year—since January 1, 1970—about how much money has your household spent buying books for your own use? (CHECK ONE)

39

64 None	269 Between $50 and $100
262 Less than $25	172 Between $100 and $200
275 Between $25 and $50	146 Over $200.

40, 41 13. About how many magazines does your household subscribe to?

mean = 4.8 Number of magazine subscriptions

14. About what proportion of the money spent on books was spent on paperback books? (CHECK ONE)

42

110 No book purchases	253 About one-half
300 None or almost none	88 About three-quarters
328 About one quarter	109 All or almost all

15. How many book clubs do you belong to? (IF MARRIED, INCLUDE MEMBERSHIPS HELD BY A HUSBAND AND WIFE) mean = .4

43. 44

16. How long have you lived in Beverly Hills? (CHECK ONE)

45

47 less than one year
88 1-2 years
210 2-5 years
239 5-10 years
628 more than 10 years

17. The Beverly Hills Public Library is at Santa Monica Boulevard and Rexford Drive. About how far do you live from the library? (CHECK ONE)

46

142 less than 5 blocks (less than ½ mile)
492 5-10 blocks (½-1 mile)
473 10-20 blocks (1-2 miles)
91 over 20 blocks (over 2 miles)

18. About how long would it take you to get to the library using your normal mode of transportation —walking, car or bus? (CHECK ONE)

47

340 less than 5 minutes
591 5-10 minutes
194 10-15 minutes
74 more than 15 minutes

19. What is your age? (CHECK ONE)

48

67 Under 25
223 25-39
694 40-64
245 65 or over

20. Are you currently married?

49

879 Yes
338 No

21. How many children of each age in your household live *at home*? (PLEASE INDICATE THE NUMBER IN EACH CATEGORY)

50

601 No children living at home
78 Pre-school
206 Grade school
67 Junior High
225 High School
176 Older than high school (Do *not* include college students who live at college.)

22. What is your sex?

56

464 Male
763 Female

23. What was your approximate total family income before taxes in 1969? (CHECK ONE)

57

69 under $5000
63 $5-7,999
54 $8,000-$9,999
140 $10,000-$14,999
224 $15,000-$24,999
243 $25,000-$49,999
216 $50,000 or over

24. What is the highest grade in school that either you or your spouse completed? (CIRCLE ONE)

58. 59

6 7 8 9 10 11 12
5 1 7 6 11 14 187

College: 1 2 3 4
87 157 86 319
Graduate Degree: 307

60

25. Are you presently employed? (CHECK ONE)

507 Yes
114 No – Retired
232 No – Housewife
13 No – Student
76 No – other

61 26. Is your spouse presently employed? (CHECK ONE)

_____Yes
_____No – Retired
_____No – Housewife
_____No – Student
_____No – Other

27. Other comments.

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